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Krister Wihinen

Exploring Cost System Design Principles:

The Analysis of Costing System Sophistication in a Pricing Context

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Abstract

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The structural characteristics of product costing systems are a highly researched area of management accounting. This research has placed great emphasis on those characteristics of costing systems that enable the generation of accurate product cost figures to support decision-making. It has been argued that improved pricing decisions can be made if the product costing system is capable of conveying a more truthful image of the resource consumption of products. However, there is little empirical evidence to indicate the type of mechanisms by which this impact is expected to occur. The objective of this study was to explore this commonly assumed relationship by attempting to better understand which factors affect the performance of costing systems. It was also analyzed as to whether these factors are bound to specific purpose(s) of use, basically implying that costing systems should be designed to support specific managerial tasks.

The study was conducted in three main parts. In the first of these, the concept of cost system sophistication, together with its underlying assumptions regarding the performance of costing systems, was analyzed. This culminated in the conceptual framework, which attempted to more comprehensively depict the various viewpoints that must be balanced in cost system design. The role of accuracy as a starting point for cost system design was especially challenged by borrowing information quality literature that highlights the need to pay more attention to the contextual and representational characteristics of information. In the second part, these conceptual arguments were further elaborated and illustrated through the empirical analysis of cost system redesign projects that were conducted in two case companies. The factors that make an impact on the perceived usefulness of costing systems were particularly analyzed and reflected in the reviewed literature. In the final part, it was examined as to whether the intended purpose of using costing systems to support pricing affected the requirements that were placed on the cost information.

The central finding of the study was that performance of costing system cannot solely be explained by referring to the accuracy of cost information. Different costing systems certainly convey different images of organizational life, but the issue of the sense in which they are more or less accurate, or better reflect the causal mechanisms of resources and cost objects, is highly debatable. Many organizational problems do not ultimately stem from poor intrinsic quality of cost information, but also from various contextual and representational factors that affect the possibilities of using and interpreting the information in a particular decision-making context. These requirements are also dependent on the specific purpose of use, implying that the performance of costing systems cannot be understood without paying attention to the manner in which they are actually used. One implication is that limited resources should not always be directed at reducing the distortions in cost figures, but rather at improving and tailoring the content of existing information to satisfying the contextual requirements of various decision-makers.

The Road Not Taken

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

Then took the other, as just as fair,
And having perhaps the better claim
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence
Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.

Robert Frost (1916)

Acknowledgements

With the passage of time comes reflection and hindsight. Around 5 years ago, as a young Master of Science in Technology, I was faced with two very divergent roads; one led to the business world and the other to academia, with the goal of eventually obtaining the degree of Doctor of Science in Technology. I had never imagined myself working in research but still somehow took this "less traveled road". With a sigh, I would now like to blame Professor Petri Suomala for this decision, while his inspiration was probably one of the most important reasons why I began an academic career. Luckily, Petri has also been traveling along this road, since without his personal knowledge, support, and understanding, I might not have now completed the journey. For that, I would like to express to him my deepest gratitude.

There have naturally also been many other professionals who have made significant contributions to my journey and its ultimate outcome, namely this dissertation. First, I would like to thank Prof. Falconer Mitchell (University of Edinburgh) and Dr. Jouko Karjalainen (Aalto University), whose insightful comments during the pre-examination process have helped me to improve the core message of this dissertation remarkably. Second, I wish to thank all the company representatives who participated and collaborated in the research projects during recent years. Without their personal dedication to development, I would have never been capable of handling the selected topic from such a wide perspective. Most notably, I wish to personally thank Mr. Markku Pehu, Mr. Aimo Jussila, Mr. Eero Nieminen, Mr. Jarmo Talasrinne, Mr. Hannu Hallila, Mr. Esa Romppanen, and Mr. Olli Hakkola for their roles in the research projects.

Research can sometimes be lonely work, with only books and articles for company. Luckily, I have had the privilege of being a member of the Cost Management Center (CMC) research group, in which many other people are interested in the same topics (and sports). Although the sample size might be somewhat limited, I can honestly say that I have never worked in a community where the help (and criticism) is provided in such an unconditional manner as in the CMC. Unfortunately, the completion of my dissertation took so long that there is simply no space to individually thank all the CMC members who have helped me during recent years. Therefore, I want to thank them collectively for making the practice of research as vivid and enjoyable as possible. I remain wanting to personally express my gratitude to Dr. Teemu Laine and, hopefully forthcoming, Dr. Erno Selos for many long discussions about various topics of research and life in general.

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Last but not least, I wish to show my appreciation of my parents, my entire family, and all the friends who have been there for me during the past three decades. In the end, it might be that the road selected really doesn't make much difference, and it is rather the journey that truly matters. I naturally also want to express my deepest gratitude to my beloved wife, Anna-Leena, although I simultaneously hope that my appreciation towards her is more readily observable in our everyday life than in these pages. The decisions regarding future roads to take can be made light-heartedly with the knowledge that I never need to tread those roads alone.

Tampere, October 30th 2012
Krister Wihinen

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1. Introduction to the research

1.1. General background and theoretical motivation

The source of value and the relationship between prices and costs have interested philosophers and economists throughout history. Several years ago, Adam Smith (2001) wondered why some goods with the greatest value in use (e.g., water) cannot be exchanged for virtually nothing, while, simultaneously, some goods with almost no value in use (e.g., diamonds) have a high value in exchange. Since that time, economists have provided a huge amount of complex models that link industry-level prices, to supply, demand, utility, and cost factors. Nevertheless, these models have not provided a great deal of practical guidance in how to price individual products under specific circumstances. In fact, by strictly following the core assumptions of mainstream neoclassical economics (i.e., perfect markets and rational economic actors that maximize their utility), the entire business of pricing can be viewed as irrelevant, since the markets determine the prices for goods. It still remains the case that companies come across various pricing problems almost on a daily basis, and these can rarely be solved by a standardized treatise of mathematical equations. When the assumptions of perfect markets and rational actors are removed, the full complexity, and essentially judgmental nature, of pricing decisions is revealed. Prices set too low may mean that the company is missing out on additional profits that could be earned if customers would be willing to spend more for acquiring the product. Conversely, prices that are too high may reduce profits if they prevent interested customers from purchasing the product. Moreover, if initially low prices are increased to the seemingly “correct” level, the customers are likely to resist after they have already become used to the prevailing price level. This might have implications for brand image, which further affects possibilities of pricing other products in the following years. While these and many other consequences of pricing decisions are hard to anticipate and might unwind with long delays, practitioners would attach great value to any information that can support their decision-making process. Ultimately, even minor increases in average selling prices can significantly raise the profitability of companies (see e.g. Hinterhuber 2004 for some statistical evidence).

Regardless of this apparent practical importance, pricing still appears to be a rather underdeveloped and less-elaborated domain of the marketing and profitability management literature (Lucas 2003). A study by Malhotra (Malhotra 1996) revealed that under 2% of all the articles published in the Journal of the Academy of Marketing Science covered the subject of pricing. However, interest is growing and the number of pricing-related articles published in 20 marketing or business journals contained in the Social Sciences Citation Index, has steadily increased in recent years (Leone et al. 2012). The majority of these articles remain more interested in consumer behavior, marketing models, retailing, sales promotion, and advertising, than in the process of price setting directly (Leone et al. 2012). Although these topics are necessarily closely intertwined, there appears to be very little research shedding light on the actual reasoning and practices that are used to set prices for products under specific circumstances. Moreover, pricing also appears to have received little attention among the practitioners; Monroe and Cox (2001) state that fewer than 10% of companies practice any serious pricing research. This might be due to the lack of means to address the pricing problems analytically (e.g., the research has not provided appropriate tools to address the pricing problems properly), or prejudices that the prices are somewhat given and fixed (Baker 2006). For example profitability concerns rarely lead to more active management of prices, but instead to product-development activities aiming at cost-efficiency improvements or cost-cutting from operations striving for improvements in productivity. Furthermore, studies on price management confirm that the volume or market share targets tend to dominate profitability targets, implying that the price is more often seen as a vehicle for adjusting the volume, and not as much in connection with the overall profitability (Lancioni 2005).

Much of the existing research regarding price setting is concerned with the information sources on which the pricing decisions should be based. Empirical surveys in particular have provided considerable evidence that so-called 'cost-based pricing' dominates the pricing practices of companies (e.g. Shim & Sudit 1995). Ultimately, profitability seems to be secured if products are sold at prices that are higher than the costs of their production. This has stirred two fundamental debates regarding the use of product cost information in pricing. The first of these relates to the question of whether product cost information should be used at all in price setting. Marketing scholars are particularly eager to argue that the customer's willingness to pay is not linked to the cost of production, but instead stems from the value of the product (Hinterhuber 2004). Therefore, pricing should also be based on the analysis of customer value and not on product costs (Forbis & Mehta 1981). Nevertheless, the empirical evidence is fairly unanimous in stating that companies regularly use cost information to make pricing decisions. The studies conducted by Schoute (2009) and Innes and Mitchell (1995) show that pricing is among the most important and frequent purposes of use for costing systems. The second debate relates to the content of cost information and whether pricing decisions should be based on marginal or full-cost information. The economic theory advocates the use of marginal cost information in pricing decisions; however, the empirical evidence supports the claim that companies instead base their pricing on full-cost information (i.e., the cost figures used in pricing include fixed cost allocations). For example a large scale survey conducted by Govindarajan and Anthony (1983) showed that over 80% of large American Fortune 1000 industrial companies used full-cost information in their pricing decisions, while fewer than 20% used variable cost information.

It is notable that although these studies have shed some light on the questions of whether companies use cost information in pricing, and the kind of cost information they use, the question of how they actually use the information largely remains unanswered. As Drury and Tayles (2006) conclude: "A literature search, undertaken to establish the extent of recent empirical research findings relating to the role and content of cost information in pricing and profitability analysis, met with virtually no success. Given the considerable interest in costing methods, this minimal empirical interest shown in cost-plus pricing and profitability analysis is particularly surprising." This research gap provides a good opportunity to examine how product cost information is used to support pricing and the requirements that it places on cost system design. This is important, since some evidence has suggested that the managers who are responsible for pricing are not entirely satisfied with the information provided by the current costing systems. In a study by Foster and Gupta (1994), marketing managers ranked accounting information as being potentially the most valuable in making pricing decisions, among 12 different marketing decisions. Despite this high potential, they also indicated that the current value of accounting information was rather low, leading to a high "information gap" between the potential and actual value of accounting information in making pricing decisions. The reasons that were most commonly mentioned for this dissatisfaction were unavailability and unreliability of cost information and difficulties in its flexible examination. On the basis of these research efforts, it seems reasonable to conclude that 1) cost information has a high potential to improve pricing decisions, and 2) the current level of cost accounting systems has not been fully able to realize that potential. Therefore, the current principles of cost system design have not led to costing systems that satisfy the information needs of managers who are responsible for pricing decisions.

The history of modern management accounting techniques, including product costing systems, is fairly short and began in the wake of the Industrial Revolution, during the first half of the 19th century (Kaplan 1984). A common feature of the early costing systems was that they focused exclusively on the assignment of labor and material costs to finished goods (Johnson 1972). Therefore, in modern terms, they would be labeled as direct costing systems that do not allocate any fixed costs to products or periods. The impetus for overhead cost measurement and allocation (i.e., the factory burden rates) was provided by the advocates of the scientific management movement in the early 20th century, who were determined to further increase the accuracy of the unit costs of products (Kaplan 1984). As Church (1916) illustrated, early cost allocation bases included direct labor and materials, and these have preserved their popularity to the present day. During the following decades, product costing practices did not witness any major changes. However, the operational environments of companies rapidly developed to have greater complexity, with a wider range of products, increased customization, computer-aided manufacturing, flexible manufacturing systems, global competition, and just-in-time production, to name just a few change facilitators (Johnson & Kaplan 1987a). These changes led to an increased proportion of overhead costs and greater variability of resource consumption patterns among products and processes, which began to highlight the shortcomings of "arbitrary" overhead allocation methods (Cooper & Kaplan 1988a). The simplistic procedures of allocating indirect costs to products were still sufficiently accurate to satisfy the requirements of financial reporting (i.e., to measure profits by allocating periodical costs between stocks and costs of goods sold), but they did not provide a great deal of information for decision-making purposes. As Johnson and Kaplan (1987a) conclude, product costing systems had failed to respond to the changing environment, and the majority of the companies were using practices that were obsolete and no longer relevant to changing and competitive manufacturing environments.

Activity-based costing (ABC) was introduced in the 1980s to answer this emerging management accounting crisis. The basic promise of ABC was greater accuracy in indirect cost assignment through the utilization of multiple cost pools and cost drivers (Cooper & Kaplan 1988b). During the following decade, ABC got wide attention among the academics, consultants and practitioners and the companies began to use ABC systems. However, these design projects were not always successes, and reported implementation rates began to stagnate and remained at rather low levels (e.g. Innes et al. 2000). Some companies were even abandoning the already implemented ABC systems, which led many people to conclude that these systems had "failed" in practice. In the aftermath, researchers became interested in the factors relating to the implementation and success of ABC systems. However, they encountered some serious problems in drawing the line between these systems and traditional costing systems (see e.g. Dugdale & Jones 1997), and the focus of analysis slowly shifted to the more general features of "sophisticated" product costing systems. The sophistication of product costing systems became defined through the number and nature of cost pools and cost drivers, which were viewed as approximating the potential of product costing systems to produce accurate cost information (Al-Omiri & Drury 2007). Nevertheless, the results of these studies remained highly inconclusive and controversial, and have not been successful in shedding light on the appropriate design of product costing systems under specific circumstances. Drury and Tayles (2005) sum up this literature stream by concluding that: "It would appear that the factors influencing the design of product costing systems are poorly understood". Therefore, there is a clear need to understand the factors influencing performance of product costing systems under specific circumstances.

Although it seems to be commonly accepted that product costing systems must be designed to support existing managerial needs (e.g. Geiger 1999b), almost no studies have attempted to analyze how these systems can be designed to support various managerial tasks (i.e., different purposes of use). In fact, even those studies that have tried to identify the factors influencing the design of costing systems have not incorporated the purpose(s) of use into their sets of examined contingency variables (e.g. Drury & Tayles 2005, Al-Omiri & Drury 2007). It has simply been argued that, under specific circumstances, the importance of accurate product cost information is likely to increase, which should lead to the use of more sophisticated product costing systems. However, the accuracy of indirect cost allocation is only one aspect of cost system design, and managers are also likely to place value on other factors, such as timeliness. In order to improve understanding of the appropriate design of product costing systems, the impact these other important characteristics have on the performance of the system should be examined. The contextual factors that affect the relative importance of these factors under specific circumstances also require exploration. For example, if the requirements placed on cost information differ significantly among the various purposes of use, it might be that the same costing system is perceived as highly useful for certain managerial tasks, but not for the others. An improved understanding with regard to these questions should make it possible 1) to design cost systems that better fit specific purpose(s) of use under certain circumstances, and 2) to allocate scarce development resources where partial improvements to product costing systems are capable of producing the highest benefits. This should eventually lead to improved decision-making (i.e., better pricing decisions in this case), which is the ultimate motivation for this dissertation.

1.2. Research objective and questions

As Gummesson (2000) points out, studies in management are essentially concerned with improving business performance, which can be accomplished by giving recommendations for solutions to specific problems under specific circumstances. Since also management accounting falls into this category of "applied sciences", the discipline should not shy away from attempting to provide information that may help practitioners to attain their goals (e.g., to enhance business performance) instead of pursuing some universal truths. This is highlighted by Malmi and Granlund (2009) who call for increased recognition of this type of "normative theories" of management accounting, which instruct practitioners on how to organize accounting and control practices under specific circumstances. It is also essentially what is pursued in this dissertation, through the analysis of cost system sophistication and the ways in which companies design their costing systems to support specific purpose(s) of use. In practical terms, the objective of this dissertation is to better understand what makes a product costing system perceived as being useful, and whether these perceptions are bound to the specific purpose(s) of use for which the system is designed.

The discussion around cost system design principles is currently dominated by the accuracy of indirect cost allocation methods, namely the specific use of cost pools and cost drivers. For example, Cooper (1989a) stated that "The art of designing an ABC system can be viewed as making two separate but interrelated decisions about the number of cost drivers needed and which cost drivers to use. These decisions are interrelated because the type of cost drivers selected changes the number of drivers required to achieve a desired level of accuracy". This alleged importance of accuracy is also visible in the current conceptualization of cost system sophistication, which has nevertheless failed to enhance the understanding of contextual factors that affect the appropriate cost system design. Furthermore, it seems that the efforts of building product costing systems that are more accurate have not led to systems that are actually perceived by users as being more useful. Therefore, the first research question of this dissertation aims to study the characteristics of product costing systems that affect their performance in particular decision making situations. The performance of costing system is here mainly understood in terms of user satisfaction, intensity of use and perceived usefulness, which can be observed through case studies. Moreover, these characteristics are reflected on in the light of the existing literature regarding cost system sophistication and design principles, in order to assess whether they convey a fair view of the most important cost system design choices. The first research question can be formulated as follows:

Research question 1: *Does the current discussion around cost system design choices and sophistication provide an adequate understanding of the factors that affect the performance of product costing system?*

One striking characteristic of the discussion around cost system design principles and sophistication is that the systems are commonly addressed without any explicit reference to their intended purpose(s) of use. For example, all the empirical contingency studies that have focused on cost system design principles have omitted the purpose(s) of use from their lists of examined contingency variables (e.g. Drury & Tayles 2005, Al-Omiri & Drury 2007). However, if the factors that affect the performance of product costing systems (i.e., research question 1) are actually bound to the purpose(s) of use, the appropriate design of costing systems may not be understood without reference to their actual usage. Therefore, the second research question attempts to examine whether pricing, as a purpose of use, affects the requirements placed on cost information and eventually the cost system design choices that are made. Pricing provides a natural context for exploration of the design of product costing systems for a specific purpose of use, since the use of cost information to support pricing decisions has been one of the fundamental debates in the pricing literature. The second research question can be formulated as follows:

Research question 2: *As a purpose of use, does pricing affect the requirements placed on the product costing system and how these requirements are reflected into the cost system design choices?*

Together these research questions address the problem of how to design product costing systems that better support managers in their decision-making under specific circumstances. By answering the first research question, a more profound understanding is generated with regard to the design choices and characteristics of product costing systems that affect their performance. Particularly the role of accuracy and its operationalization through the indirect cost allocation methods is critically examined. The second research question can be understood as an attempt to validate the role of specific purpose(s) of use as a relevant contingency variable in cost system design. Therefore, it is explored whether the requirements placed on a product costing system are actually shaped by the intended use of the system, and how this reflects on the various cost system design choices that are made. The purpose of answering the second research question is two-fold. First, it serves to provide support for the general argument that cost accounting systems should be designed for specific purpose(s) of use. Second, it attempts to shed light on the complex processes of supporting pricing with cost information and product costing systems. These contributions should eventually lead towards the design of product costing systems that can better support managerial decision-making in general, and pricing decisions in particular.

1.3. Philosophical and methodological foundations

It is nowadays commonly accepted that no research is value-free and all scientists approach their research subjects with certain explicit and/or implicit assumptions regarding the nature of the world and the way in which it may be investigated (Burrell & Morgan 1979). Kuhn (1996) referred to these fundamental assumptions and beliefs by using the term “paradigm”, which can be viewed as a collection of logically related assumptions, concepts, or propositions that orient thinking and research. These paradigms are essentially different world views, so they must be accepted simply on faith and cannot be proven true or false in a conventional sense (Guba & Lincoln 1994). Therefore, many essential questions defining paradigms fall under the branch of philosophy known as metaphysics, which is concerned with theories of existence and knowledge in the broadest possible terms. The debate as to whether the physical world exists independently of human thought and perception (i.e., realism), or whether it is dependent on the conscious activity of humans (i.e., idealism), is one of the fundamental questions of metaphysics that has puzzled philosophers throughout history (see e.g. Warburton 2006). Although many workaday scientists do not have the time or inclination to assess their research in philosophical terms, they are nevertheless heavily influenced by the answers to these questions. As Kuhn (1996) points out, scientific disciplines are normally dominated by a certain paradigm during a particular period of time, which also tends to become (at least implicitly) adopted by new researchers entering the field. Since these new scientists are educated via the books and articles written under the ruling paradigm (i.e., the mainstream), their world view is likely to be based on the same fundamental beliefs as their teachers and supervisors (Kuhn 1996). Therefore, they become committed to the same rules and standards of scientific practice, meaning that they study the same subjects, pose similar research questions, use currently accepted scientific methods and interpret results by following the same thought patterns (Lukka 2010).

The notion of the research (or inquiry) paradigm has become a central concept in social sciences, and the philosophical assumptions affecting how research is conducted are commonly discussed in terms of competing paradigms (Heron & Reason 1997). Guba and Lincoln (1994) argue that the paradigm differences can be addressed through the answers to three fundamental and interconnected philosophical questions relating to ontology, epistemology and methodology. The ontological question regards the form and nature of reality and what can be known of it (i.e., it is closely related to the more general debate of realism versus idealism). Therefore, it concerns the very essence of the phenomena under investigation (Burrell & Morgan 1979). The epistemological question relates to the nature of the relationship between knower and what can be known (Guba & Lincoln 1994). Therefore, this question regards the grounds for knowledge; for example, what forms of knowledge can be obtained, or how one can distinguish “false” from “true” (Burrell & Morgan 1979). The methodological question asks how one can find out what one believes can be known (Guba & Lincoln 1994). It clearly brings the paradigmatic discussion closer to the practical consequences for conducting research, hinting for instance that some methods might be preferable under a certain paradigm. The answer to the methodological question is also partly interrelated with the ontological and epistemological assumptions, which together guide the researcher towards specific methodologies (Burrell & Morgan 1979). The assumptions of the social world as “real” reality and the researcher as an objective inquirer for example mandate the search for universal laws that explain and govern the reality that is observed. In this instance, the important methodological issues include, for example, the concepts themselves, their measurement, and relationships between the concepts. This is further reflected in the methods that the scientist is likely to employ.

The literature of social sciences is full of different conceptualizations of alternative research paradigms. Guba and Lincoln (1994) use the three previously mentioned fundamental questions to identify four competing paradigms (i.e., positivism, postpositivism, critical theory and related ideological positions, and constructivism). Burrell and Morgan (1979) essentially use the same questions, but combines them into the dominant subjective-objective dimension (i.e., assumptions regarding the nature of social science) of their well-known taxonomy of alternative paradigms. The second dimension is based on assumptions about the nature of society, especially whether it is characterized by order or conflict. On the basis of these, Burrell and Morgan (1979) identify four paradigms, namely functionalist, interpretive, radical humanist, and radical structuralist. Chua (1986) has further discussed these paradigms in the field of accounting, suggesting that the interpretive and critical paradigms are promising alternatives for the current mainstream (functionalist) research. Although these and many other specific paradigms have been commonly discussed in the methodology literature, researchers appear more often to position their work simply in terms of an “antithesis between two schools of philosophy: the positivistic, traditional natural science school and the humanistic school.” (Gummesson 2000). The positivistic school (i.e., the objective end of the continuum) stems from the natural sciences and postulates that a true explanation or cause for social phenomena can be found and tested by scientific standards (Roth & Mehta 2002). The humanistic school (i.e., the subjective end of the continuum) is more often referred to as hermeneutics or interpretivism, but the common denominator is the emphasis given to the view that reality is subjectively and socially constructed. Table 1 presents an illustration of the most important differences between these opposite schools of thought.

Table 1. *Illustration of core differences between positivism and hermeneutis/interpretivism (adapted from Roth & Mehta 2002).*

Positivism	Hermeneutics/ Interpretivism
Causation – Seeks to understand the causal explanation for a phenomenon or event	**Interpretation** – Seeks to understand how people interpret a phenomenon or event
Objective reality – Presumes the "existence of facts"	**Subjective reality** – Recognizes the "construction of facts"; facts are seen as interpreted and subjective
Generality – Analysis seeks a "law" that extends beyond specific instances studied	**Specificity** – Analysis is context specific and based only on the subjective understanding of individuals within a specific context
Replicability – Analyses can be tested and verified empirically against other cases	**Self-validation** – Analyses can only be self-validating, through the consistency and coherence of "thick descriptions"

When reflecting on the characteristics displayed in Table 1, it is easy to state that the philosophical foundation of this dissertation is clearly closer to hermeneutics/interpretivism than positivism. The researcher is neither seeking to unravel any causal explanations or law-like relationships between the concepts of interest, nor even believes that such explanations necessarily exist. Rather, the aim is to make sense of, and understand how, individuals perceive and interpret the usefulness of certain costing practices in specific temporally and socially constructed contexts. However, it should be noted that the researcher neither believes in the strict distinction between objective and subjective research (see e.g. Ahrens 2008 for similar views). Although it is acknowledged that the world view of the researcher heavily influences the studied field and the interpretations that are made, it is simultaneously believed that these interpretations are not purely subjective and learning from accounting as a contextual phenomenon is possible. Therefore, not all versions of reality are held as equally true and it is believed that learning from one particular context can also be applied to the understanding of the same phenomenon in other contexts. This view is shared at least by Kakkuri-Knuuttila et al. (2008), who point out the number of case studies that are considered to represent the "interpretive approach" to accounting research, but which actually possess both subjectivist and objectivist features. It is also somewhat believed that "reality" can only be understood by making oneself part of it and occupying the frame of reference of the participants in action. That is, one must understand the phenomenon from the inside (emic) rather than the outside (etic) perspective (see for example Headland 1990 for the discussion of emic). But in order to provide a contribution to scientific knowledge, one must also have the ability to provide some explanations from the external perspective (Kakkuri-Knuuttila et al. 2008). Together, these beliefs form the core philosophical framework of the researcher, which is further reflected in the research approach that is adopted in this dissertation.

A mere interpretive framing of research leaves considerable leeway for a variety of alternative methodological choices that characterize the way in which the research is actually conducted (Kasanen et al. 1993). Therefore, various methodological viewpoints (together with their underlying philosophical assumptions) are commonly discussed under various research approaches, which help to further position and describe the characteristics that are present. The Finnish research tradition of business economics has adopted the classification that uses theoretical-empirical and descriptive-normative axes to distinguish four alternative research approaches (Neilimo & Näsi 1980). Using this simple taxonomy, this dissertation could be labeled as action-analytical, a research approach that is characterized by reasoning based on empirical data and the purpose of providing normative proposals that help management in running a firm. The closest counterpart in more international methodological discussion is likely action research, which captures many of the important characteristics that are present in this dissertation. Action research originates from the ideas of Kurt Lewin (1946) who suggested that change experiments could also be made in the field, and not just in laboratories. In management accounting, the application of action research embodies an important move toward the interpretive school of thought (Westin & Roberts 2010). Since action research accepts a purposeful act of intervening in a studied system of relationships as a legitimate part of conducting research, it can also be viewed as a starting point for interventionist research (Baard 2010). Interventionist research has attained considerable attention during recent years, in part because it has been suggested as a potential approach to produce theories with important pragmatic implications (Jönsson & Lukka 2007).

While some authors hold action research as one form of interventionist research (e.g. Suomala & Lyly-Yrjänäinen 2012), others consider interventionist research to be a member of the action research family (e.g. Westin & Roberts 2010). This dissertation does not take a stance regarding the exact relationship between these concepts, but uses some of their shared features (see for example Gummesson 2000 for further characteristics of action research) to describe the methodological choices that are made (i.e., the adopted research approach shares many features that are discussed with regard to both concepts). First, the aim of the research is to contribute both to practice (i.e., the problem encountered by the “client”) and to scientific knowledge (Rapoport 1970). Moreover, the hope is not only to contribute to both practice and science as separate entities, but also to contribute science in a manner that provides important pragmatic implications (Suomala & Lyly-Yrjänäinen 2012). Second, the role of the researcher is not simply that of a detached observer, but more readily as an active participant or a change agent who works at making the change happen (Coughlan & Coghlan 2002). By making purposeful interventions in the natural flow of events, the researcher may stimulate the change and then observe the responses to that change. The challenge is naturally to step back from the action and reflect on the observations of the theoretical underpinnings that enable a contribution to scientific knowledge. Third, the research process is interactive and comprises iterative cycles of gathering data, analyzing data, planning action, taking action, evaluating the consequences, gathering further data, etc (Coughlan & Coghlan 2002). This type of research process may unfold in many unpredictable ways, so researchers and practitioners must work together closely and constantly adapt to the unfolding story (Susman & Evered 1978). This adaptation process, including the constant re-evaluation of research problems, may be viewed as a necessity stemming from the uncertainty of problem solving efforts, but it is also an important mechanism through which the practical relevancy of the research is ensured (Suomala & Lyly-Yrjänäinen 2012). Important research questions sometimes only reveal themselves through active collaboration and engagement in problem-solving activities. Certainly this was the case with regard to the research questions that are presented in this dissertation.

1.4. Empirical research design, data and methods

Since the aim of this research is to pursue in-depth understanding of a particular phenomenon and context, it is not necessary to study a large number of instances (Gummesson 2000). Therefore, this dissertation examines product costing and pricing practices using two longitudinal case studies. Yin (Yin 1981) has defined case study as a research strategy (comparable, for example, to experiment or simulation), which is commonly associated with qualitative methodology, qualitative data and participant observations. However, they are not the distinctive features of case studies, since the form of evidence may well be qualitative (e.g., words), quantitative (e.g., numbers), or a combination of the two (Eisenhardt 1989a). In a similar manner, multiple data collection methods (e.g., interviews, observations, questionnaires, archives, etc.) are commonly utilized in case studies, although the role of “first-hand” data is especially highlighted (Meredith 1998). In fact, the use of multiple data collection methods is one of the important virtues of case studies, since it enables “perceptual triangulation”, which ensures that the correct interpretation of the situation is made (Bonoma 1985). According to Yin (1981), the distinctive feature of case study as a research strategy is the attempt to examine a contemporary phenomenon in its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. Therefore, it is a rather natural choice in the adopted research approach, which highlights the need to understand the nature of product costing and pricing practices from the emic perspective. For example experiments detach the phenomenon from its context, and also surveys, restrict the possibilities of considering the temporal and contextual aspects of the phenomenon under study (Meredith 1998). Therefore, they would not be equally suitable choices for the purposes of this study. Some of the key characteristics of case studies are represented in Table 2.

Table 2. *Key characteristics of case studies (adapted from Benbasat et al. 1987).*

No.	Characteristic that is commonly present in case studies
1	Phenomenon is examined in a natural setting.
2	Data are collected by multiple means.
3	One or few entities (person, group, or organization) are examined.
4	The complexity of the unit is studied intensively.
5	Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have a receptive attitude towards exploration.
6	No experimental controls or manipulation are involved.
7	The investigator may not specify the set of independent and dependent variables in advance.
8	The results derived depend heavily on the integrative powers of the investigator.
9	Changes in site selection and data collection methods could take place as the investigator develops new hypotheses.
10	Case research is useful in the study of "why" and "how" questions because these deal with operational links to be traced over time rather than with frequency or incidence.
11	The focus is on contemporary events.

Many authors have commented that there are advantages and disadvantages to every research strategy: no one strategy is appropriate for all research purposes. The most often referred to strengths of case studies are that 1) the phenomenon can be studied in its natural setting, enabling the generation of theories that are relevant for practice, 2) the questions of why, what and how can be answered with in-depth understanding of the phenomenon, and 3) exploratory investigations where the variables are yet unknown are possible (Voss et al. 2002). Given these inherent strengths, Scapens (1990) points out that "Case studies offer us the possibility of understanding the nature of management accounting in practice; both in terms of the techniques, procedures, systems, etc. which are used and the way in which they are used". This characterization closely describes the aims of the present study, since the phenomenon of interest is the actual use of product costing systems to support pricing. Case studies can nevertheless be used in a variety of ways, depending on the methodological underpinnings that are adopted (Scapens 1990). In the traditional positivistic world view, case studies are merely treated as small samples, and their role is limited to hypotheses development, model construction and provision of limited empirical tests (Meredith 1998). However, a withdrawal from this traditional stance has been occurring, and the case study has become an increasingly accepted scientific tool for use in conducting research and especially in building theories (Gummesson 2000). Scapens (1990) distinguishes five different types of case research (i.e., descriptive, illustrative, experimental, exploratory, and explanatory), which may all serve different purposes. By using this terminology, the use of cases in this dissertation combines the features of exploratory, explanatory, and illustrative studies. The research could be positioned as exploratory, in the sense that cases are intended to be preliminary investigations regarding the reasons for particular accounting practices (Scapens 1990). Conversely, the purpose is also to take a step further and use these observations to provide preliminary explanations for some of the prevailing practices. Finally, the case studies are illustrative, in the sense that they are used to illustrate the plausibility of the more conceptual arguments of this dissertation.

The empirical data used in this dissertation are primarily based on two long-term research projects funded by the Finnish Funding Agency for Technology and Innovation (TEKES) and participating companies. The first of these is entitled "ARPA" (1/2007-12/2008) and it focused broadly on the potential of service innovations in three case companies. The empirical data used in this dissertation are based on one of the case companies (i.e., a domestic industrial bakery known as FinnBakery), were especially product costing and pricing practices were examined. The efforts around these topics were viewed as a prerequisite to realizing the potential related to new service innovations that were under consideration by the company. Since I used this particular project in my own master's thesis, it cannot be stated that the case was specifically selected for this dissertation because it provided certain interesting perspectives regarding the topic "at hand". Rather, the work conducted in FinnBakery aroused my interest in this specific topic by providing a basic understanding of how the product cost information was used in the pricing of rather undifferentiated food industry products. Although the project ended at the end of 2008, the cooperation with FinnBakery has continued to the present day, in the form of unofficial meetings and consultancy. This has provided a unique possibility for long-term reflection on the findings and implications of the research interventions. Therefore, it has provided an understanding of the practices that actually remained alive in the company, as well as those that eventually died, without my active input as a researcher. Moreover, it has been possible to somewhat "validate" the interpretations made during the writing process by discussing them with the company representatives who participated in the project. It is also notable that three conference papers were written on the basis of the empirical data gathered during the project, which helped to ensure that the data were closely analyzed immediately afterwards, and not only during the writing of this dissertation (naturally, the data gathering and analysis greatly overlapped and this had already occurred to a great extent during the formal project).

The second research project is called “PromaFuture” (1/2009-12/2011) and it primarily focused on profitability management in the mechanical engineering industry. The empirical data used in this dissertation are based on one of the two case companies that were involved in the project (i.e., an international machine manufacturer called FinnMechanics), whereby the role of pricing in profitability management was especially examined. To be honest, it must be stated that neither the second case was originally selected on the basis of theoretical sampling principles (see e.g. Eisenhardt 1989a). As explained by Meredith (1998), theoretical sampling aims to select cases on the basis of theoretical (and not statistical) reasons, for example, to replicate previous cases, to extend emergent theory, to fill theoretical categories or to provide examples of polar types. Since the specific topic or potentially emerging theory of this dissertation was still very much in the formation process, the use of theoretical sampling would actually have been rather difficult at this time. The case was more readily selected because it provided in-depth access to a company that was interested in same phenomena that were already examined in the first research project. The case studies may still be viewed as representing somewhat polar types with regard to the environment of product costing and pricing, despite the lack of intentional theoretical sampling. While FinnBakery operates in competitive business-to-consumer markets with standardized and undifferentiated high-volume products and low market shares, FinnMechanics operates in less competitive business-to-business markets with customized and differentiated low-volume products and high market shares. As a result, the research setting and topic of this dissertation was slowly guided toward a direction that takes advantage of this partially coincidental opportunity. As noted by Eisenhardt (2007), the polar types represent an important theoretical sampling approach whereby a researcher samples extreme cases in order to observe contrasting data patterns. In this case, it provided an opportunity to observe both the common (i.e., to what extent the cases were similar, despite their nature as polar types) and contrasting (i.e., to what extent the cases were different, despite sharing pricing as a common denominator) patterns with regard to the use of cost information in pricing. Although the second project officially ended at the end of 2011, the cooperation with the case company has continued to the present day in the form of a new research project. Therefore, it has also been possible to discuss the ideas presented in this dissertation with the company representatives after its completion. The case studies and the writing process that followed are presented in the timeline in Figure 1.

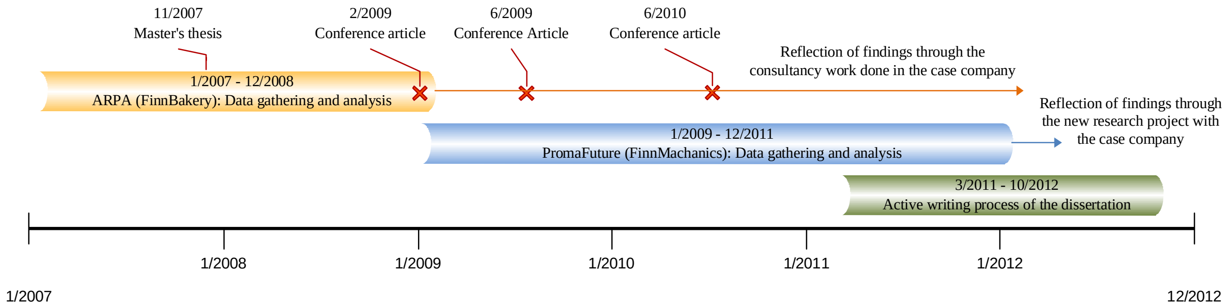


Figure 1. *Timeline of the research process leading to this dissertation.*

As already noted, the decision to use case studies does not directly impose the use of specific research and data gathering methods (Ahrens & Chapman 2006). However, the aim to solve practical management accounting problems in close collaboration with the practitioners (i.e., the interventionist research approach) strongly guided the research toward the use of a specific type of research technique. In both of the conducted case studies, the role of participant observation as a method of data gathering was highlighted. Participant observation can be described as a method "…in which the observer participates in the daily life of the people under study, either openly in the role of researcher or covertly in some disguised role, observing things that happen, listening to what is said, and questioning people, over some length of time" (Becker & Geer 1957). In this instance, the participant observation was conducted openly in the role of researcher, but the close collaboration and lengthy time-period enabled the obtaining of "insider status" in the organization. It was hoped that this method would provide a deeper understanding of the multiple aspects of the phenomenon, which may not be easily conveyed through interviews, questionnaires or archival data, for example. However, semi-structured/unstructured interviews and archival data (e.g., formal/informal calculations, descriptions of practices, manuals, organization charts, statements of policies, etc.) were also used to better understand the historical pattern through which the current situation has emerged. This can be seen as a form of triangulation, which aims at improving the validity of results by combining multiple methods in the study of the same phenomenon (Jick 1979). In practice, it meant for instance that the interpretations regarding the performance of designed product costing systems were made both by observing if and how people actually used the systems and by directly asking them about the performance through the interviews. The total number of various face-to-face meetings with the company representatives (i.e., possibilities for participant observation) is presented in Table 3. It is notable that the communication also included numerous e-mails and phone calls that are not listed here.

Table 3. *Number of face-to-face meetings with the company representatives.*

Type of the meetings	FinnBakery	FinnMechanics
Case-level project meetings: Typically rather informal meetings with various representatives from the case company. The aim is to advance the project towards the agreed objectives by discussing the recent developments/ findings/ problems etc.	110-130	60-70
Case-level steering group meetings: More formal meetings with regular representatives from the case company and the research group. The aim is to discuss the findings with a broader audience and guide the project accordingly towards the desired case specific objectives.	10	15
Project-level steering group meetings: Formal meetings with regular representatives from all the case companies, the research group, and the funding agencies. The aim is to discuss the importance/ meaning of the findings at the project-level, guide the project, review the budget etc.	5	8

As indicated in Table 3, both research projects were characterized by extremely close collaboration between the researchers and practitioners. In practice, the core project group held meetings virtually on a weekly basis in order to advance the project toward the agreed targets. These meetings generally lasted from 2 to 6 hours, and also usually included other people who possessed valuable information regarding the specific topic and problem at hand. In total, approximately 20 different people from both organizations were involved in the projects at some point during the execution. The functional viewpoints that were represented included those of top management, sales and marketing, accounting and finance, production, and R&D (although the role of R&D in FinnMechanics was rather minor). This extensive collaboration with a variety of people from different organizational functions has hopefully led to a relatively comprehensive view regarding the nature of product costing and pricing practices in both companies. It should simultaneously help to mitigate the risk of retrospective sense-making and impression management, which are sometimes considered to be serious problems when dealing with interviews and participative observations (Eisenhardt & Graebner 2007).

1.5. Scope and limitations

In broad terms, this dissertation concerns the design of product costing systems to support specific purpose(s) of use, particularly pricing decisions. The term 'product costing system' was primarily adopted simply because it was used in the majority of previous studies of the same topic (e.g. Drury & Tayles 2005, Al-Omiri & Drury 2007). The product costing system refers quite explicitly to the purposes of assigning costs to products, but many other potential cost objects (e.g., customers) also exist. In fact, the product costing systems (i.e., the systems where product is the final cost object) also usually have other intermediate/secondary cost objects (e.g., cost centers or activities), which are used to further assign costs. Therefore, it is quite difficult hard to distinguish between product costing systems and costing systems in general, especially in the era of enterprise resource planning systems. In this dissertation, the main focus is on efforts to assign costs to products, but the potential to support pricing by assigning costs to alternative cost objects is also recognized. Therefore, it would be more precise to discuss the design principles of costing systems in general, and both terms (i.e., product costing system and costing system) are used almost interchangeably herein. In a similar manner, pricing can be conceptualized to include many issues regarding such variables as consumer behavior, distribution channels, advertising, promotions, brands, and quality of products and services (Leone et al. 2012). Although many of these issues are touched on in this dissertation, the main focus is on companies' aim of specifying the certain monetary amount (i.e., the price) that is charged to a specific customer under specific circumstances.

The clarification of essential concepts is not sufficient to frame the scope of this dissertation and some further limitations are needed. At the highest level, product costs are required for two purposes; 1) for financial accounting to allocate the manufacturing costs incurred during a period between cost of goods sold and inventories, and 2) for the support of managerial decision-making (Drury & Tayles 1994). This dissertation focuses on the use of product cost information to support managerial decision-making, and the requirements stemming from financial accounting are left largely unconsidered. The focus is on the characteristics of the information that are perceived to be useful from the pricing perspective (i.e., internal use of cost information), rather than whether such information collides with current financial accounting rules (i.e., external reporting). In a similar manner, the potential use of product cost information for transfer pricing is deemed outside the scope of this study. Although transfer pricing is essentially managerial decision-making within the domain of pricing, it is likely to be guided by totally different factors (including legislation) from pricing in the conventional sense. Therefore, the focus here strictly regards the transactions between independent companies. It is still observed that the requirements stemming from these more regulated practices (especially the inventory valuation) may affect the judgments regarding the product costing system, especially since the controllers and accountants are aware of these potential purposes of use. For example, people may implicitly diminish the role and importance of indirect cost allocations, since they anticipate the problems regarding the changing inventory values.

The use of case studies as a research strategy naturally also affects the scope of research and sets certain limitations regarding the extent to which the findings can be generalized (Eisenhardt 1989a). Notwithstanding, the intent is not to be apologetic regarding the lack of universal truths that were found, since the purpose was never actually to seek them. The case studies used in this dissertation should not be primarily interpreted as small "preliminary samples", which can be directly used to generate testable hypotheses for large-scale empirical surveys (which could then be used to generalize the findings). They are rather populations as such, so the findings are also necessarily both temporally and spatially circumscribed (Meredith 1998). It remains important to point out certain characteristics of the explored case studies that might have influenced the interpretations that are made. Foremost, it should be stressed that both of the case companies are rather small when compared to the populations of typical surveys regarding product costing systems. Therefore, it might be that the entire question of designing the product costing system to support certain purpose(s) of use is relevant to small companies only. It is quite likely that large multinational companies will use costing systems to simultaneously support various different decision-making purposes. It should still be noted that these companies may also have many local product costing systems and the importance of different purpose(s) of use might vary considerably. Therefore, the product costing systems that are designed to support "all kinds of decisions" must also similarly balance the various requirements that are placed on the cost information. If this is true, the theoretic generalizability of the study might also apply to these situations; the same theory simply postulates different consequences.

Finally, the interventionist research approach and close collaboration between the researcher and the practitioners might raise some concerns regarding the validity of the findings (see e.g. Susman & Evered 1978). Since the researcher has actively participated in the action, he has changed the natural flow of events in the participating companies. In practice, it is highly unlikely that the companies would have established similar product costing systems in the absence of the research projects. However, the purpose is not primarily to predict the characteristics of the systems that companies are likely to design, but rather to provide information that assists them in designing costing systems that are effective under prevailing circumstances. Therefore, it is possible to intervene in the actual design process and then observe how people react to the changes (i.e., the initiator of the change is not particularly important). The close collaboration with the subjects of the study still affects the interpretations that the researcher is able and willing to make. At least two possible pitfalls were recognized during the writing process of this dissertation. Initially, while much of the data analysis takes place in retrospect, it becomes tempting to explain everything by the deliberate acts of rational actors. Events that may have seemed irrational as they occurred become easily rationalized by facts that appear to justify them. As a consequence, historical narratives have commonly resembled logical chains of causes and effects, although the personal living of these events was actually characterized by chaos (Taleb 2007). Second, although the ability to make sense of social events is likely to require in-depth understanding, this understanding easily converts into explanations through various "hidden agendas" that are not actually observable in the data. For example, the lack of interest towards product cost information may come to be "explained" by the power struggle between the accountants and managers, although there is no evidence that such a struggle (even if it existed *de facto*) affected the situation. Given that the collaboration between the author and practitioners was extremely close during the research projects, this dissertation is also prone to these, and many other, related biases and limitations. However, it is hoped that the early recognition of these problems helped in preparing to avoid the most obvious pitfalls.

1.6. Overview of the thesis

This section briefly describes the structure of the dissertation, together with the most important relationships between the primary chapters. It should be immediately pointed out that the structure does not follow any kind of chronological order, suggesting that the research process proceeded in a stepwise manner from identification of the research gap to literature review, completion of case studies and presentation of findings. In reality, this process was far more complex and iterative, and included the simultaneous gathering and analysis of the data and constant reformulation of research questions, based on the preliminary findings. Figure 2 simply represents the structure of the dissertation in a manner that is perceived to logically lead the reader from the crafting of research questions to the final conclusions and implications.

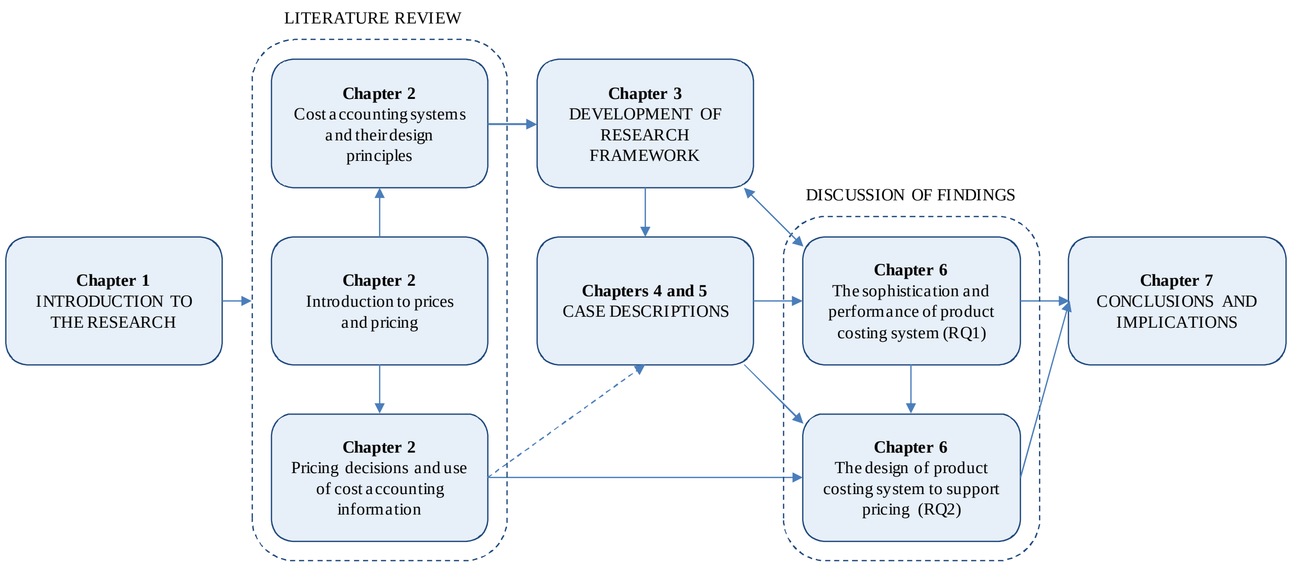


Figure 2. *Overview of the thesis.*

Chapter 1 serves as an introduction to the research process that led to this dissertation. It briefly describes the theoretical background and the motivation to conduct the research, and crafts the research objective and questions based on this discussion. After formulation of the research question, the chapter aims to describe the philosophical and methodological foundations that guided the research. By explicitly stating and positioning the research approach that is adopted, it is possible to better understand the nature of the knowledge that is pursued. In this case, the purpose is not to discover any universal context-free laws, but rather to understand temporally- and contextually-embedded social practices. Finally, the empirical research design describing the concrete plan through which the knowledge is pursued (e.g., research strategy, methods, gathered data, etc.), together with the scope and limitations of the research are discussed.

Chapter 2 reviews the relevant literature regarding the established research questions. It is divided into three parts; 1) introduction to prices and pricing, 2) pricing decisions and the use of cost accounting information, and 3) product costing systems and their design principles. The first part of the chapter introduces some of the fundamental debates regarding prices and pricing and examines these from the viewpoints of the economics, marketing and accounting disciplines. It serves to provide an understanding of the wider issues to which the dissertation is linked. The second part goes deeper into the anatomy of pricing decisions and sums up the literature regarding the role of cost information in supporting pricing practices. Finally, the third part of the chapter examines the basic functioning and design principles of product costing systems, illustrating the way in which the characteristics of the produced cost information are shaped by the various cost system design choices. In addition, the concept of cost system sophistication and related contingency literature regarding cost system design choices are introduced.

Chapter 3 serves as a bridge between the theoretical and empirical parts of this dissertation. It aims to conceptually address the first research question by examining whether the current discussion around cost system design principles and sophistication (i.e., the third part of the literature review) adequately capture the factors that affect the performance of product costing systems. On the basis of the analysis, a conceptual framework, which attempts to link contextual variables (e.g., purpose of use) to cost system design choices through the requirements placed on general information characteristics is created. This framework is used to broaden the understanding of potential factors affecting the appropriate cost system design and later to make sense of the observations regarding the case studies. It should be pointed out that although the framework is based on the literature review, it was temporally created during the second case study. Therefore, it is likely that the observations from the case studies also subconsciously affected the final structure and content of the framework.

Chapters 4 and 5 provide descriptions from the case studies that were conducted. The structure of both chapters is very similar and is divided into four parts. Initially, an overview of the case companies and their operational environments are described in order to convey the idea of the contexts in which they operated. Second, the initial state (i.e., the state before the intervention) of the product costing practices and the use of cost information in pricing are briefly described, together with the perceived problems relating to these practices. An understanding of the starting point is likely essential in order to understand the meaning of the results. Third, the process of cost system redesign and the changes made to the initial product costing practices are described. Finally, the implications of these changes for pricing practices are illustrated, together with perceptions regarding the performance of the established costing systems. In a sense, this last part serves as a brief within the case analysis that attempts to identify the characteristics and design choices that were eventually perceived to be important, and whether they affected the pricing decisions that were made. The primary purpose of the chapters is nevertheless simply to describe the data from which the inferences and conclusions are subsequently made.

Chapter 6 focuses on discussing the findings of the case studies in the light of the postulated research questions. In brief, the chapter aims to answer the presented research questions by theoretically referring to the case evidence that was provided in the previous chapters. The chapter is divided into two parts that quite closely reflect the content of the two research questions. In the first part, the empirical data are used to put flesh on the bones of the first research question and the theoretical claim that a more profound conceptualization of cost system sophistication is required; i.e., that the cost system design principles associated with the sophistication do not adequately reflect the factors that affect the performance of product costing systems. In the second part, the claim that the design choices affecting the performance of the system are actually contingent on the purpose(s) of use is examined by using pricing as an "exploratory case study". The aim is to discuss whether the requirements placed on the product costing systems are actually shaped by their intended use, and how these requirements are reflected in the various cost system design choices that are made. Information regarding the actual use of cost information in pricing is also simultaneously provided.

Chapter 7 draws together the most important findings of the dissertation and briefly examines their contribution to the existing knowledge. Some major limitations of the study and its findings are also discussed in this chapter, and it presents some guidelines for the further research. Finally, the practical relevance of the dissertation is examined through the discussion of managerial implications.

2. Literature review

2.1. Introduction to prices and pricing

2.1.1. Theories of value and prices in economics

The sources of value and their connection to prices have interested the economists, or “worldly philosophers”, as they were called by Heilbroner (2000), throughout the history of modern society. Although Aristotle had explained that a piece of goods can obtain a price because there is a need for it, the world had to wait until the time of Adam Smith for a more profound concept of value and prices. In his book “An inquiry into the nature and causes of the wealth of nations”, Smith (2001) observed that many goods that have a great use value can be used in exchange for virtually nothing (i.e., they have no value in exchange). In his highly quoted formulation of the problem, Smith asked why water is so cheap and diamonds so expensive, even though water, not diamonds, is critical for survival. He identified labor as the essential source of all value, and concluded that the exchange value of any piece of goods is equal to the quantity of labor that it enables him to purchase or command. In a more practical formulation of the idea, Smith pointed out that if it takes twice as much time to hunt a beaver than a deer, a beaver should be valued at twice the price of the deer. Given the implicit assumption of rational utility-maximizing individuals, it was natural to suppose that if exchange values would settle in any other ratio, behavior would also be modified (Buchanan 1969); if the price of a beaver was three deer, a rational hunter would hunt beavers even if he would demand deer. In Smith’s view it was significant that value was viewed as an intrinsic characteristic of a piece of goods, and prices were based on the costs necessary to produce that item. These theories are more generally called “intrinsic theories of value”, and subsequently the likes of David Ricardo (2001) and Karl Marx (2001) further advanced the idea of labor being an essential source of a product’s value. They both acknowledged that the means of production (e.g., machines) also adds value to products, but only to the extent that labor is required for their production. Intrinsic theories of value have dominated classical economics since the 1870s, when marginal revolution replaced them with subjective theories of value in mainstream economics.

Although there were several references to marginal utility before the actual marginal revolution, subjective theories of value found a foothold through the work of Carl Menger, Léon Walras and Stanley Jevons in the 1870s. Jevons (1866) was the first to observe that the continued uniform application of any piece of goods will not produce equal amounts of pleasure, and every successive application is likely to excite feelings less. Although water is critical for the survival of people, the utility of additional units of water quickly decreases as it is used for irrigation, washing and other activities that are not directly survival-linked. This law of diminishing marginal utility came later, as one of the key concepts of neoclassical economics. While labor theories of value considered everything that is gained through work as valuable, subjective theories of value recognized that, to possess a value, a product must be both useful and scarce. Therefore, a piece of goods itself has no particular intrinsic value related to the labor needed to produce it, but value is linked to its utility “at the margin” (Menger 2007). Walras (1954) linked this idea of marginal utility to prices in the exchange economy by pointing out that as long as there is excess demand for a product, prices tend to rise. In a free market economy, a product is exchanged only when both parties believe that they receive more value than they give away, and the price is simply a means to communicate information about the value. These observations later led to the development of general equilibrium theory, which remains probably the most influential theory in economics. The famous illustration of the equal roles of supply and demand in the determination of prices is depicted in Figure 3.

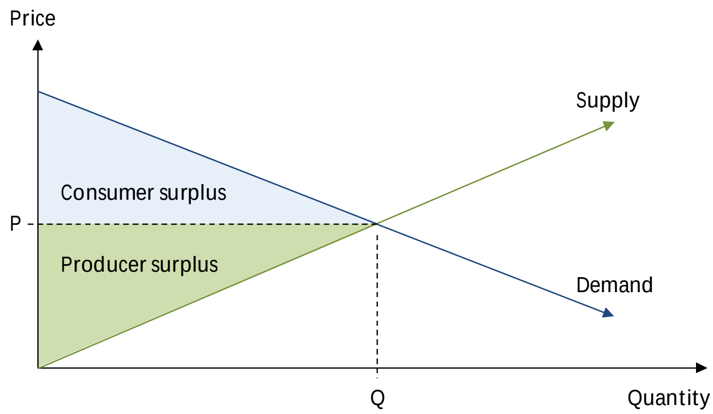


Figure 3. *Equilibrium of demand and supply (adapted from Marshall 1920).*

While classical economists primarily linked the value of a piece of goods to its production costs, the marginalists weighted its utility in favor of its possessor. Alfred Marshall (1920) partially merged these economic schools together by recognizing that both views held some merit, and the source of value is dependent on the time period under consideration. He argued that in a competitive market, long-run prices will gravitate to a point where the quantity demanded by consumers will equal the quantity supplied by producers, resulting in an economic equilibrium of price and quantity. Suppliers will produce additional units as long as the cost of producing an extra unit (i.e., the marginal cost) is less than the price they will receive. In a similar manner, consumers are willing to buy additional units as long as the marginal utility of additional consumption equals the marginal utility of alternative consumption choices. Marginal cost of production and marginal utility will meet at a point of equilibrium, which determines the quantity produced and the prices paid. Marshall (1920) also pointed out that although long-run prices are greatly affected by production costs, production cannot be immediately adjusted to changing demand in the short-term. Therefore, prices at any particular point of time (i.e., short-run prices) are largely determined by the utility of products. These ideas have some important corollaries, including the basic law of supply and demand (Skouras et al. 2005), which states that if demand increases and supply remains unchanged, then equilibrium price and quantity increases and vice versa. Nowadays, the relationship between price and quantity demanded is commonly addressed in terms of price elasticity of demand, which provides a convenient way to discuss the buyer’s response to changes in price (Skouras et al. 2005). Price elasticity measures the responsiveness of the quantity demanded to a change in price, which is typically either a weak (i.e., inelastic demand) or strong (i.e., elastic demand) inverse relationship (i.e., higher price, lower demand) with regard to almost all goods. These ideas remain at the core of modern price theory, although some authors have pointed out that the tendency for marginal production costs and market price to equal one another does not mean that the value of a piece of goods is actually “determined” by its costs (Baker 2006).

The economic price theories presented here all rely heavily on assumptions of perfect competition, rational preferences, and utility maximization. Under these conditions, supply and demand curves are determined by marginal cost and marginal utility (i.e., marginal revenue for a producer), respectively, and profit maximization occurs at the point at which the marginal cost of production equals the marginal revenues (Lucas 2003). Subsequent research has identified many constraints on these conditions, including imperfect competition (e.g., monopolistic and oligopolistic market structures), information asymmetries (e.g., the information is not equally divided among different parties) and bounded rationality (e.g., cognitive biases), but the promise of price optimization is still highly visible in mathematical models of price-setting in economics (Skouras et al. 2005). The impact of market structure on pricing in particular has been studied at length, and there is a considerable amount of literature regarding the optimal pricing of new products under various market structures (see e.g. Kalish 1983, Dockner & Jørcensen 1988). In other words, mainstream economics still treats pricing largely as an exercise of utility-maximization under specific constraints. Thaler (1985) criticizes economic theories on the basis that they are usually grounded on normative principles and characterize the solution to the problem first, and then further assume that agents act accordingly. Since normative macroeconomics has primarily been interested in the way that human beings should behave, it has not required descriptive models of human behavior (Simon 1959). However, if the aim is to describe and improve the actual pricing processes in companies, such models are required. Therefore, the more practice-oriented marketing and accounting literature has somewhat ignored the potential contributions of economics, and has focused on more behaviorally rich accounts of pricing practices (Skouras et al. 2005). In particular, the assumptions of rational behavior and profit maximization as a single pricing objective are commonly challenged.

2.1.2. Pricing in practice – Do companies maximize profits?

The rational behavior of economic actors likely remains the most fundamental assumption in mainstream economics. In the context of pricing, it has commonly taken the form of profit maximization being the single goal of a company (Lucas 2003). Nevertheless, in his famous defense of the profit-seeking behavior of companies, Milton Friedman (2007) asked: “What does it mean to say that “business” has responsibilities? Only people can have responsibilities”. It is equally relevant to ask what it means to say that companies set or pursue certain pricing objectives. Ultimately, it is individuals, rather than companies, who set objectives or pursue certain goals. This was also realized in the field of pricing, and the growing separation between ownership and management slowly began to direct attention toward the motivations of managers (Simon 1959). As a vast amount of research in agency problems subsequently confirmed, the objectives of the principal (i.e., the owners or managers) and agents (i.e., departments or employees) might actually diverge quite significantly (see e.g. Eisenhardt 1989b for a literature review). Although it is somewhat plausible that the owners of a company are interested in long-term profitability, other stakeholders (e.g., individuals and departments) may have their own goals/aims in addition to their likely subscription to the overall interests of the company (Donaldson & Preston 1995). Particularly in the lower levels of organizations, profitability can be viewed as a necessary condition for continued production, rather than the end in itself (Roberts & Scapens 1985). At the level of the individual, managerial theories of the firm suggest that managers seek to maximize their own utility, which may include salary, security, power, and prestige, among other factors. These additions to utility function led to a completely new wave of optimization models, which placed their emphasis on the maximization of multiple objectives, including managerial utility, sales, growth, and security (Skouras et al. 2005). However, the specific content and nature of utility function was not the only problem with economic theories. A far more relevant question was whether the assumption of optimization/ maximization is reflective of human behavior in the first place. For example, people might be far more interested in pursuing prices that are easily justifiable to their supervisors, rather than maximizing profit in any way (Urbany 2001).

The empirical study conducted by Hall and Hitch (1939) was groundbreaking, since it provided the first evidence to indicate that firms neither aim at any kind of maximization, nor make their pricing decisions on the basis of marginal analysis (as proposed by the neoclassical economic theory). The authors concluded that the behavior of companies can be better understood by their conceptualization as entities seeking satisfying, rather than maximized, results. Simon (1959) subsequently further elaborated on the idea of satisfying behavior and established the concept of "bounded rationality" to describe the limitations placed on "rationality as optimization". He concluded that decision-makers generally lack the abilities and resources to arrive at the optimal solution, so they would rather seek a satisfying solution by simplifying the decision problem at hand. Various common biases included in human decision-making under uncertainty, which prevent people from behaving as "rational computation machines", have been specified in subsequent research (e.g. Kahneman & Tversky 1979, Tversky & Kahneman 1981, Kahneman 2003). The data provided by Hall and Hitch (1939), together with the growing evidence of alternative pricing objectives, generated a substantial amount of research and debate regarding the pricing behavior of firms during the 1950s and 1960s, which resulted in a broader view on the relevant aspects of pricing objectives (Machlup 1967). Lanzillotti (1958), for example, provides preliminary confirmation of the hypothesis postulating multiple simultaneous pricing objectives by finding that the majority of the large companies set more than one pricing objective. These objectives also seemed to vary from one company to another, depending on the current market situation. The recognition of multiple simultaneous objectives quite naturally raised the further question of the relative importance of different goals and the potential interrelationships between them.

Shipley (1981) provided further information regarding the relationships between pricing objectives by conducting a large scale survey in the British manufacturing industry. The study confirmed that companies set multiple pricing objectives, but also showed that the profit target is, almost without exception, one of them. Two thirds of the respondents explicitly regarded the profit target as their principal pricing objective and there were also some grounds to suspect that the majority of the remaining companies pursued profits, merely by means of other pricing objectives. Therefore, the assumption of profit maximization was not yet buried and Diamantopoulos and Mathews (1994) argued that the studies in which it was criticized may have simply failed to capture all the dimensions of pricing objectives with their research instruments. They suggested that pricing objectives should be further analyzed under three primary headings related to their content (i.e., the specific objectives), the desired level of attainment (i.e., maximization versus satisfaction) and the associated time horizon (i.e., short-term versus long-term). This suggested that the pricing objectives of companies might constitute a highly complex network, in which different objectives are either satisfied or maximized, depending on the time period at hand. Furthermore, Shipley (1981) hints that different objectives might actually be hierarchical in nature and typically that the qualitative objectives (i.e., the objectives describing the relationship of the company to its customers, distributors, competitors, or market itself) are viewed as a means to achieve the quantitative objectives (i.e., the objectives related to financial measures). Therefore, pricing objectives related to markets, customers, and competitors may primarily be only ways to achieve profitability and secure the existence of a company in the long term (Diamantopoulos & Mathews 1994). Despite these improvements and the growing volume of literature, the question of how firms actually specify their pricing objectives remains to be satisfactorily answered.

2.1.3. Gap between pricing theory and accounting practices

Although prices are central to almost every fundamental economic theory, economics as a discipline has provided only little guidance for the managers responsible for daily pricing practices (Nagle 1984). However, this is not the fault of economics as a discipline, and already Jevons (1866) understood the unsuitability of industry-level economic models for providing practical guidance for the decision-making of individuals. In his article describing the principles of marginal utility, he stated that: “Of course such equations as are here spoken of are merely theoretical. Such complicated laws as those of economy cannot be accurately traced in individual cases. Their operation can only be detected in aggregates and by the method of averages. We must think under the forms of these laws in their theoretic perfection and complication; in practice we must be content with approximate and empirical laws.” Therefore, economic theories are not even meant to realistically describe the way in which firms actually make their pricing decisions, but rather to describe the general principles on which successful pricing decisions can be based (Nagle 1984). Concepts such as value, consumer surplus, price elasticity or supply and demand cannot be directly used to derive specific pricing algorithms, but it would simultaneously be extremely hard to make any successful pricing decisions without any understanding of these concepts. Nagle (1984) uses the analogy of structural engineering, which is not labeled as irrelevant simply because it fails to show architects how to design buildings. In essence, marketing and accounting are disciplines concerned with business practice and performance, while economics is a social science aimed at improving the organization of society (Skouras et al. 2005). Despite these clearly different perspectives and objectives, the incongruity of neoclassical pricing theory and actual pricing practice has stirred up some serious discussion across all these disciplines. The discussion of marginalism in cost analysis in particular was highly visible throughout the 1940s and 1950s, a time that later became known as that of “marginalist controversy” (Lucas & Rafferty 2008). During those years, accountants tried to call into question the neoclassical economic theory of the firm, while economists primarily concentrated on questioning and undermining their empirical survey evidence.

Robbins (1952) defines economics as “the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses”. This definition encompasses an important notion that all economic costs are opportunity costs, meaning that the cost of using scarce resources to produce something is the benefit of the next best alternative use for the same resources (Baxter & Oxenfeldt 1961). Although long-run average cost figures also have a place in economic theory (i.e., they determine the long-run equilibrium in a time period, with no fixed factors of production), the fundamental cost concept in economics is the marginal cost (i.e., the cost of marginal change in quantity, based on foregone benefits) related to short-run decisions where at least one factor of production is fixed in amount (Bromwich 2007). The level of fixed costs is usually seen as an endogenous decision variable for the firm, and once the bundle of fixed resources has been decided, the optimization happens by using the short-run cost function. From a theoretical viewpoint, profit maximization occurs at the sales level where the marginal revenue equals the marginal cost, since the incremental cash flows of producing more or less units are both negative at that point (Kee 2008). For all practical pricing purposes, this would mean that fixed cost allocations are irrelevant in decision-making, since they do not actually change on the basis of short-run pricing decisions. However, already Hall and Hitch (1939) provided some evidence that firms do not set prices on the basis of these marginalist principles of neoclassical economics, but use a certain form of average (long-run) unit cost figures that also include fixed cost allocations. This behavior is better understood in terms of Simon (1959), who emphasized the limitations of rationality as optimization, and conceptualized humans as being more interested in achieving satisfactory results. In order to achieve satisfactory returns, revenues must be capable of covering all the costs of being in business and of earning a profit that provides a satisfactory return on investment (Govindarajan & Anthony 1983). In the context of pricing, this might lead to the use of full-cost pricing, since it seemingly ensures that prices are capable of recovering all the costs associated with each product.

Following identification of the gap between actual pricing practices and normative principles of neoclassical economics by Hall and Hitch (1939), many different econometric, survey, and case studies have been conducted in an attempt to shed light on the full-cost pricing practices of companies. The fundamental question has been whether the companies actually base their pricing decisions on marginal analysis of costs (i.e., the costs that actually change, based on the decision) or on some long-term average full-cost figures, including fixed-cost allocations. The majority of the studies have found support for the full-cost hypothesis (e.g. Nordhaus & Godley 1972, Govindarajan & Anthony 1983, Shim & Sudit 1995, Carson et al. 1998, Avlonitis & Indounas 2005, Drury & Tayles 2005), but those that support the marginal cost hypothesis also exist (Martin 1997). When analyzed together, these empirical studies discussing the reality gap are somewhat controversial and highly inconclusive, and cannot provide any final resolution for a problem (Lucas 2003). Edwards (1952) has also claimed to have found some evidence of "implicit marginalism", which suggests that although firms may not explicitly balance marginal costs and revenues, they may nevertheless act accordingly. Companies might have, for instance, established some rules of thumb, through which they are capable of acting according to marginalist principles without explicit calculation of decision-relevant costs and revenues. In the end, there is considerable evidence that although companies may initially arrive at some prices on a cost-plus basis, they almost always adjust these prices on the basis of competition and demand situations (Skinner 1970). Friedman (1953) has formulated this instrumentalist view more generally by stating that theories can be judged only on the basis of their predictive power and not on the correctness of their assumptions. Therefore, the only test for the neoclassical pricing theory would be the match (or mismatch) between the actual selling prices and those derived from the theory.

Although the arguments presented by Friedman (1953) may have some merit, science must be capable of producing something better than theories with no causal relationships between assumptions and predictions (Bacharach 1989). (Friedman 1953)However, it seems unlikely that any empirical evidence could have the power to resolve the controversy one way or another, since the conflict between the disciplines is also a conflict between competing paradigms (Lee 1990). As already noted by Kuhn (1996), the empirical tests are themselves always theory-laden and cannot provide final resolution among the competing theoretical paradigms. Baxter and Oxenfeldt (1961) have proposed that the conflict between accounting and economics might even be unreal, if the cost-plus pricing practices are viewed as a way of putting marginal approach into effect. According to their suggestion, the allocation of overheads might yield a rough guide to opportunity costs and should rather be interpreted as a price that is put on direct labor- or machine-hours. Some studies have recently attempted to focus on the examination of different conditions under which full-costs lead to an optimal resource allocation and pricing (e.g. Banker & Hughes 1994, Kee 2008). For example, at the point where capacity is equal to quantity demanded with given prices, long-run marginal costs (including the cost of capacity) equal short-run marginal costs, so both cost concepts can be used in decision-making (Bromwich 2007). However, neither of these findings can be used to justify the arbitrary allocation methods that are commonly used to allocate overhead costs to products. In the absence of any satisfactory resolution, both parties appear to have adopted the path of ignorance towards the possible insights provided by the other, and the disciplines have slowly turned to look for alternative theories on pricing and prices. Lucas (2003) sums up this trench warfare position between the disciplines by stating that: “The accounting literature ignores the implicit marginalism and instrumentalist arguments of the economics literature, while the economics literature has tended to accept any evidence of incremental reasoning as equivalent to the full application of marginalist principles”. In accounting, institutional economics has been proposed as an alternative approach to explain why companies still use full-cost pricing practices (Scapens 1994).

Not all economists agreed with the neoclassical world view, even in the early 20th century; for example, Thorsten Veblen (e.g. 1898, 1900) argued that people should be analyzed as individuals and not in aggregate measures depicted by terms such as “labor”. His work can be seen as setting the foundations for institutional economics, which suggest that people are not simply floating in the web of causal influences, but also act for reasons that are not causes and must therefore be understood in different terms (Outhwaite 1987). Of particular importance is the role of institutions, which can consist of both the formal legal rules and the informal social norms that govern individual behavior and structure social interactions. A commonly held view is that a particular behavior cannot be understood or explained outside its specific context; the social system, which is set by a complex interaction of various institutions (e.g., individuals, firms, states, social norms etc.). In relation to pricing, Ahmed and Scapens (Ahmed & Scapens 2003) have described how cost accounting and full cost-pricing practices became institutionalized in Britain through certain historically specific events and circumstances. Two events of major importance were the evolution of industry-uniform costing systems to avoid price competition, and the development of the cost-based pricing method in order to set prices for governmental contracts during the First World War. As a result, the concept of cost that became accepted was full-cost, ensuring the systemic recovery of all monetary inputs invested into production (instead of marginal cost). As a result, the concept of cost that became accepted was full-cost, ensuring the systemic recovery of all monetary inputs invested into production (instead of marginal cost). These procedures subsequently became accepted as standards and spread to other companies. Professional accounting institutions and universities further disseminated and strengthened these procedures as a part of the professional training of accountants (Johnson & Kaplan 1987a). Pricing and costing procedures can only be understood within this background, and their role in current society may still relate to the maintenance of stability in the markets (Ahmed & Scapens 2003). Moreover, companies have their own historical trajectories, which might be far more relevant for the understanding of practices than any governing laws or law-like relationships between different market conditions (Scapens 1994). Furthermore, the case evidence provided by Lucas and Rafferty (2008) suggest that the institutional economics might provide better tools with which to understand the actual decision-making processes in companies than the neoclassical economics.

2.1.4. Marketing literature in search of pricing theory

While economics can be described as a discipline interested in theory of prices, marketing is rather a discipline searching for theory of pricing. Since real market conditions differ significantly from perfect competition, individuals are guided by bounded rationality, and information is asymmetrically divided; company-level decision-making is guided by completely different rules and routines than those prescribed by mainstream economics (Nagle 1984). As a consequence, more behaviorally rich marketing research and more theoretically solid economic research remain standing largely apart and rarely refer to one another (Skouras et al. 2005). An additional reason may be that economic theories commonly omit all the focal marketing variables, with the exception of the price and product characteristics, which may not be a seductive starting position for marketing academics (Thaler 1985). For example, the framing of decision-making situations may radically alter the behavior of people, but does not fit to the traditional economic models of rational behavior (Tversky & Kahneman 1981). Despite the "rejection" of economic theories, marketing has not been capable of providing any significant competing theories and can still be regarded as a discipline with no guiding or unifying theory (Shipley & Jobber 2001). However, some less known branches of economics are not actually far removed from the position adopted by marketing academics. The most notable of these is probably the school of Post Keynesian economics, which was established to provide a more realistic picture of decision-making in firms. The Post Keynesian price theory argues that prices of the firms are neither based on the production costs, nor on scarcity or utility, but largely reflect the purposes and interests of individual firms (Shapiro & Sawyer 2003). In this respect, Post Keynesian price theory adopts the contingency view on decision-making and denies the universal laws providing solutions for all different circumstances. Moreover, it provides a justification for the more behavioral approach of marketing research, which primarily focuses on customers' responses to prices and different pricing methods, tactics, strategies, and their execution.

While the economics and accounting literature appear to be interested in finding a single (equilibrium or cost-based) price for a product, the marketing literature is strongly guided by the idea that nothing such as a single "right" price exists. Rather, the customers' willingness to pay derives from their individual perception of the value, and prices should reflect these differences (Forbis & Mehta 1981). Although this view can be regarded as a guiding principle in marketing-based pricing research, the basis for this notion can be found in economics. Marshall (1920) already noted that there are always some customers who are willing to pay more than the equilibrium price for a product, and named the difference between these two as a consumer surplus. Since Marshall (1920) was primarily interested in equilibrium prices under perfect competition, for him consumer surplus was simply a result of the functioning of a free market economy. For marketing researchers, who reject the standard assumptions of classical economics and are interested in prices of single companies, it provides a promise of profit improvement potential that can be captured by using improved pricing methods, strategies, tactics, and practices. As Klompmaker et al. (2003) point out, any single price level leaves profits on the table with the existing customers, and simultaneously misses the opportunity to sell products to new customers who have some potential to contribute to profits. Since all prices above the variable costs are capable of covering at least some fixed costs, even those prices below average costs may actually increase profitability (Indounas 2006). Aligning the prices with customers' perceptions on value allows for the possibility of capturing the full profit potential across the segmented target markets (Klompmaker et al. 2003). This essential promise of price differentiation is illustrated in Figure 4.

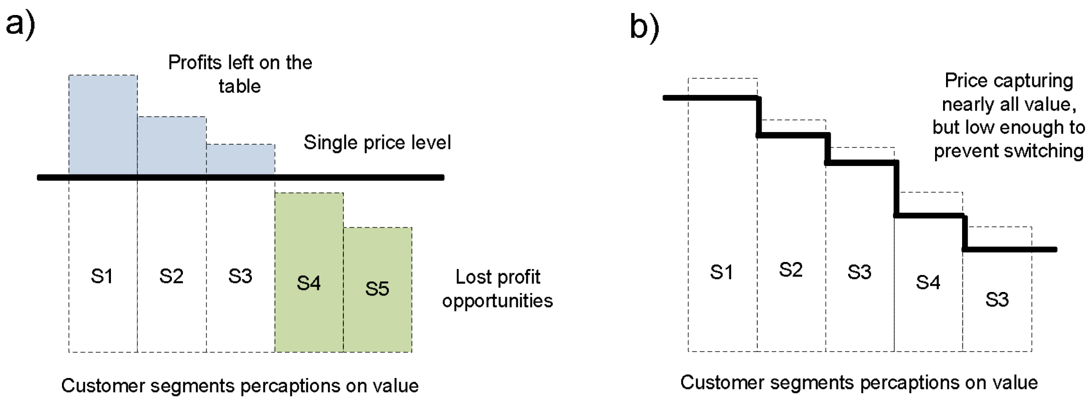


Figure 4. *Profit opportunities in single-price (a) and price differentiation (b) approaches (adapted from Klompmaker et al. 2003).*

In the marketing literature, the concept of customer value has attained growing interest during recent decades and is now considered to be one of the most important concepts (Ravald & Gronroos 1996). It is also central from the pricing perspective, since the pricing power is commonly regarded as being derived from the value to the customer. Despite this growing interest, the marketing literature still appears to be lacking in a commonly approved definition for customer value, and the term is constantly mixed with other concepts, such as customer-perceived quality and customer satisfaction (Ulaga & Chacour 2001). However, all the definitions provided (see Ulaga & Chacour 2001 for a list of existing definitions) appear to share some characteristics, which can be seen to form the essence of the concept. As Woodruff (1997) concludes, customer value is generally interpreted as something perceived by customers that involves a trade-off between the benefits and sacrifices (Woodruff 1997). Therefore, the value is determined solely by the customer and includes the evaluation of benefits compared to costs (i.e., the price is included in the definition). The most commonly used single definition for customer value (at least in the marketing literature) is probably that given by Monroe (1990), who defines it as the ratio of perceived benefits relative to perceived sacrifices. Although this definition is widely used, it is rather impractical for pricing purposes. If the customer value is conceptualized as something that includes the perceived sacrifices, the price becomes part of the definition and affects the value itself (Hinterhuber 2004). Therefore, a definition that is independent of the price is required for pricing purposes. Forbis and Mehta (1981) provides this by defining the economic value of products to customers as "the maximum amount a customer should be willing to pay, assuming that he is fully informed about the product and the offerings of competitors". Following this line of thought, value is more directly linked to the monetary amount that a customer should be willing to pay after comparing the alternative offerings and reference prices in the market (Grewal et al. 1998). Nagle et al. (Nagle et al. 2011) further elaborated on this concept by dividing customer value into reference value and differentiation value. Reference value is the price of the best competitive alternative, while differentiation value is the incremental use value that the product delivers over and above that of competitive substitutes. Therefore, the company's ability to price its product is dependent on the value of the features that distinguish it from the other products in the market. Since this definition of value is independent of a product's own price and is clearly dependent on competitive prices, it provides a more useful conceptualization of customer value for pricing purposes.

Given the promise of profit improvement through price differentiation and value-oriented pricing methods, companies should (1) assess the customer value, (2) segment the markets accordingly, (3) capture the created value by pricing, and (4) isolate different segments from one another by using specific fences (Cross & Dixit 2005). Each of these issues has drawn considerable attention in marketing research, and particularly methods and problems related to customer value assessment have been discussed. As Forbis and Mehta (1981) argue, significant differences in customers' perceived value exist on the basis of variables such as intensity of product usage, geographical scope of usage and nature of the application. Moreover, customers do not attach value to only the physical attributes of products, but also consider also different service attributes and the available technical support (Monroe 1990). Therefore, customers are not interested only in the core product, but rather in the "total value proposition" that the product delivers (van der Haar et al. 2001). This might also include attributes that are not related to the subject of exchange, but instead to an existing relationship between the customer and the supplier (Ravald & Gronroos 1996). The existing relationship might be valuable in itself for both parties involved, and the benefits delivered through a long-term relationship (e.g., safety, credibility, security, continuity) might differ considerably from the benefits delivered through a single transaction (Ravald & Gronroos 1996). Despite the complexities of the value creation mechanism, researchers have developed multiple techniques to assess customer value, from in-depth interviews to complex preference analyses. The different versions of conjoint analysis (i.e., stated preference analysis) have drawn wide attention in particular, and there is some evidence of their usefulness both for customer value evaluation and market segmentation purposes (e.g. Auty 1995, van der Haar et al. 2001). The basic idea of conjoint analysis is to reveal the relative importance of different features of a product offering by forcing respondents to make trade-offs between them (Green et al. 2001). This also has some drawbacks from the pricing perspective, since people who are forced to make paired comparisons of isolated prices and product features, might become unrealistically price-sensitive (Simon 1992); that is, they overestimate the role of price in their genuine decision-making process. Given these and many other problems related to value assessment, Hinterhuber (Hinterhuber 2004) concludes that the complexity of value-creating mechanisms remains the main challenge for marketeers. In the absence of any solid theoretical framework to solve the problem, the marketing literature is filled with different empirically reasoned frameworks that address the pricing problem in specific circumstances.

2.2. Pricing decisions and the use of cost accounting information

2.2.1. Anatomy of pricing decisions

Although pricing decisions are commonly discussed in the literature, their actual content or meaning is seldom defined precisely, so it is unclear as to which decisions are essentially pricing decisions and where the borders stand. The only specific pricing situation that is widely recognized in the literature is new product pricing, which includes the setting of a certain price level at a specific moment of time (e.g. Monroe & Della Bitta 1978, Tellis 1986, Noble & Gruca 1999). Considering the life cycle of products, it would be tempting to conclude that price changes, or pricing of an existing product, would formulate another common pricing situation, but only few studies appear to have analyzed price changes as a distinctive category of pricing decisions (Monroe & Della Bitta 1978). This might play some part in the fact that pricing is sometimes understood as a mechanistic one-off task, which aims at setting a price level ("a number") for a single product (Dutta et al. 2003). In practice, managers face pricing problems encompassing hundreds of different products, customers, competitors and geographic regions. Given this complexity, it is unlikely that any single price is capable of achieving the pricing objectives in all markets, and considerable price differentiation is required. Moreover, while market and company conditions change constantly, prices should also be continuously adjusted to reflect the current competitive environment (Shipley & Jobber 2001). Therefore, pricing cannot merely be interpreted as a one-off task, but rather as an ongoing process whereby prices are constantly analyzed and updated. Shipley and Jobber (2001) emphasize this process nature of pricing by formulating different pricing activities in a wheel-like formation. Their depiction of the pricing process naturally includes the actual price-setting phase, but also other phases aimed at planning, implementing, and monitoring different aspects of pricing decisions. In a similar manner, Lancioni (2005) argues that companies should develop a comprehensive pricing plan that addresses the key areas of price timing, price execution, price control, price setting, and price implementation. While many academics agree with this, Monroe and Cox (2001) state that fewer than 10% of companies actually practice any serious pricing research. The framework provided by Shipley and Jobber (2001) is presented in Figure 5.

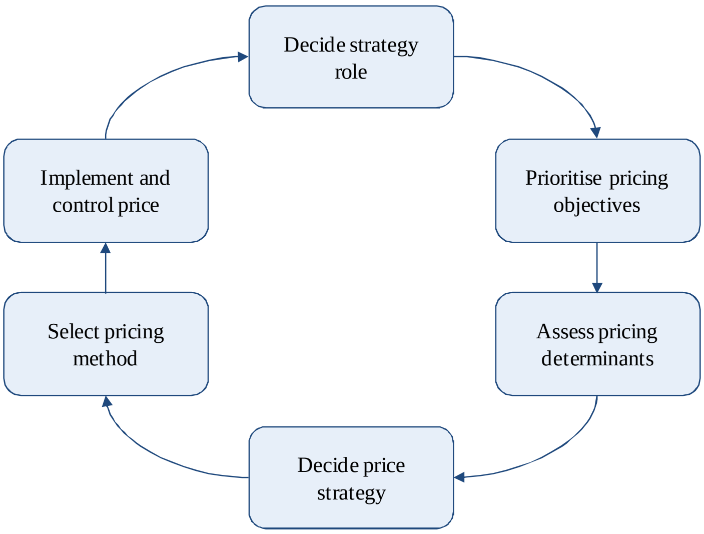


Figure 5. *Pricing as a continuous process (adapted from Shipley & Jobber 2001).*

While pricing cannot be understood in terms of one-off decisions, it also cannot be viewed in isolation from the wider contexts of marketing and business strategy. Every aspect of the marketing process affects pricing in various ways, so pricing decisions are very often inseparable from decisions concerning other elements of the marketing mix (Lancioni 2005). For example, decisions concerning the product mix or distribution channels quite clearly affect the appropriate pricing strategy for a company. This has also been recognized in the literature, and wide array of studies have analyzed optimal decision-making schemes in different joint problems. The most scrutinized joint problem is likely capacity-pricing (e.g. Banker & Hughes 1994), but other problems, such as product mix-pricing (e.g. Balakrishnan & Sivaramakrishnan 2002) and advertising-pricing (e.g. Gupta & Di Benedetto 2007) have also been discussed. While these joint problems can be conceptualized as two separate decision-making situations (e.g., pricing and advertising decisions), it is equally justifiable to conceptualize pricing as a decision including advertising. Regardless, pricing decisions are clearly interfunctional and must be coordinated with other related decisions (Smith 1995). Lancioni (2005) suggests that companies should form specific multifunctional pricing committees that are capable of accounting for all the many and varied perspectives related to pricing decisions. These committees should include members from sales and marketing, operations, logistics, accounting, finance, and management at the very least. In practice, no evidence of the wide use of specific pricing committees exists, but pricing rarely remains the responsibility of any single organizational function (Smith 1995). Given this nature of group decision-making, pricing decisions might be better explained as a result of a number of social phenomena rather than of mechanistic process (Cyert 1963). As Dutta et al. (2003) point out, if the internal participants fail to agree on a price change, the pricing decisions might not necessarily be implemented at all.

Pricing can neither be interpreted as a process that aims only at setting specific prices for various products, services and markets. Rather, it involves the determination of pricing strategies, tactics and policies that are implemented in order to achieve specific pricing objectives. The discussion regarding different pricing strategies was begun by Joel Dean (1950), who formulated two alternative strategies (i.e., price skimming and penetration pricing) for a new product-pricing situation. Price skimming aims at maximizing the profits by setting high product launch prices, while penetration pricing uses low prices in order to gain volume and large market shares. These basic strategies are still commonly referred to, but a much greater variety of different pricing strategies, tactics, and policies are currently recognized (Nagle 1984). The problem is that many fundamentally similar pricing strategies are described by multiple names and are given overlapping definitions, making it extremely difficult to obtain a good overview of the current state of research. Tellis (1986) tries to deliver a solution to the problem by classifying different pricing strategies under a single framework and developing a unifying taxonomy. Tellis (1986) has tried to bring partial relief to the problem by classifying different pricing strategies under single framework and developing a unifying taxonomy. In the taxonomy, depicted in Table 4 only the principal pricing strategy in each category is named and multiple different variants have been intentionally omitted.

Table 4. *Taxonomy of pricing strategies (adapted from Tellis 1986).*

Characteristics of consumers	Objective of firm		
	Vary prices among consumer segments	**Exploit competitive position**	**Balance pricing over product line**
Some have high search costs	Random discounting	Price signaling	Image pricing
Some have low reservation price	Periodic discounting	Penetration pricing/ Experience curve pricing	Price bundling/ Premium pricing
All have special transaction costs	Second market discounting	Geographic pricing	Complementary pricing

In this taxonomy, the pricing strategies are initially classified under three different groups, on the basis of the source of economics of scale, which is proposed to be the common denominator of different pricing strategies. The first category includes strategies whereby shared economies are pursued among different customer segments by selling the same brands at different prices to different consumers (i.e., price differentiation). The second category includes strategies whereby prices are set to exploit a competitive position. This essentially means that shared economies are pursued by selling products to different market segments at the same competitive price (economies of scale). In the third category, all strategies are focused on providing shared economies by selling related brands at prices that exploit mutual dependencies. The actual pricing strategies under each category are further classified on the basis of the primary characteristics of consumers. For example, if some consumers are characterized by high search costs, a random discounting may be used to sell products to these customers typically at a high price, while simultaneously providing possibilities for more well-informed consumers to buy products at a discount (Tellis 1986).

It is obvious that the taxonomy provided by Tellis (1986) cannot solve all the problems related to the confusing terminology. Many of the pricing strategies that are included in the taxonomy are rather limited and of narrow scope, and could also be classified as mere pricing tactics. For example, Duke (1994) points out that price signaling (e.g., using price to indicate quality when consumers have high search costs) is a narrow pricing tactic and not a genuine strategy. In a similar manner, different discounting practices may be viewed as specific tools in a larger toolbox. Regardless, the discussion around different pricing strategies, tactics and policies serves as a reminder that the pricing includes far more than the determination of initial price level. Given the complex nature of pricing decisions, Dutta et al. (2003) used the Resource-Based View and the behavioral theory of the firm as a basis for arguing that making effective pricing decisions can be viewed as a capability that can (as such) make a difference between companies. Therefore, companies should invest in pricing resources just as they would in any other resources that are capable of providing a competitive advantage. In addition, it is argued that a company cannot directly purchase a pricing process capability, but it must be developed by identifying all of the routines, skills and coordination mechanisms that have an influence on a particular company's capability to set prices. They are neither directly imitable, but companies must themselves develop pricing capabilities over time (Dierickx & Cool 1989).

2.2.2. Different modes of pricing

Irrespective of the pricing strategies or tactics that are adopted, companies must ultimately set certain specific prices for different items, target markets and periods. As a strategy, penetration pricing might indicate what is pursued by prices, but it cannot directly provide any set of prices for implementation (Monroe & Della Bitta 1978). A specific pricing method or model, consisting of set of practices that are executed by managers in order to make price decisions, is required. Ingenbleek et al. (2003) distinguish pricing strategies and practices by stating that: "Whereas pricing strategies are visible in the market in the form of price changes, price bundles, price levels within a product line, or otherwise, pricing practices are hidden behind the boundaries of the organizations". Therefore, pricing practices are organizational processes through which the actual prices are set. A quick scan of the literature used in this dissertation reveals that pricing methods are commonly divided into three categories, depending on the primary source of information used in the decision-making (see Table 5). Although there is some divergence in the terminology, all classifications fit into the trisection of cost-oriented, competition-oriented and market-oriented pricing methods. Cost-oriented pricing methods (e.g., average/direct mark-up, rate of return pricing, incremental pricing, break-even analysis) are typically seen as inward-looking practices, where key inputs into the pricing decision include variable and fixed costs and capacity utilization rates (Smith & Nagle 1994). Competition-oriented methods (e.g., follow-the-leader pricing, pricing similar to competitors, pricing below/above competitors) are more outward-looking, focusing particularly on the analysis of competitor prices and price changes (Shipley & Jobber 2001). Market oriented methods do not consist equally coherent set of specific methods, from which greater variation of terminology in Table 5 stands as a proof. However, the common denominator is the general idea that pricing should involve the assessment of customer value (Ingenbleek et al. 2003). Shipley and Jobber describes their class of "demand-based pricing methods" in the following way: "These methods involve forming estimates of how customers value the offering and customer price sensitivities and then setting prices according to what the traffic will bear". Therefore, the primary information source is related to customers and markets.

Table 5. *Classifications of pricing methods in the literature.*

Cost oriented	Competition oriented	Market oriented	Unit of analysis	Reference
cost oriented	competition oriented	demand oriented	pricing	Cunningham & Hornby (1993)
cost-based	competitor-based	demand-based	pricing methods	Shipley & Jobber (2001)
cost-informed	competition-informed	value-informed	pricing	Ingenbleek et al. (2003)
cost-based	competition-based	customer value-based	pricing	Hinterhuber (2008)
cost-based	competition-based	customer-based	pricing methods	Indounas (2009)

In 1958, the president of General Motors described pricing as a process that essentially depends on all three key sources of information (Alfred 1972). He stated: "Pricing is like a tripod. It has three legs. In addition to cost, there are the two other legs of market demand and competition. It is no more possible to say that one or another of these factors determines price than it is to assert that one leg rather than either of the other two supports a tripod". Despite this enlightened comment, the relative benefits and drawbacks of different pricing methods are still commonly discussed in the marketing literature. In particular, the cost-oriented and market-oriented pricing methods have often been considered as two completely different approaches to pricing that cannot go hand-in-hand (e.g. Cunningham & Hornby 1993, Shipley & Jobber 2001, Baker 2006). Cost-oriented pricing is reported to play the dominant role in practice, but it simultaneously also appears to be the most criticized class of pricing methods. This criticism is commonly targeted at the alleged ignorance of markets/competition and the perverse logic that costs would determine prices and not vice versa(e.g. Shipley & Jobber 2001, Indounas 2006, Hinterhuber 2008). Many marketing researchers therefore recommend that companies move toward pricing methods that are more market-oriented, but these methods have also been criticized for being too fussy and difficult to execute in practice (e.g. Shipley & Jobber 2001, Hinterhuber 2008). Although this discussion of specific pricing methods has some merit as such, it generates only little value for companies attempting to improve their pricing processes. The ultimate aim of pricing is to fulfill its objectives (e.g., market share, profits, reputation, etc.) given the restrictions (e.g., capacity or market situation), and multiple information sources are likely to have the potential to contribute to this aim.

More recently, the views that different pricing methods should somehow be integrated have been stressed (Hinterhuber 2004). There is also considerable evidence to suggest that companies almost never use a single method in isolation, and that some methods might not even exist in their purest form. For example, Skinner (1970) showed that companies always consider markets and competition factors, at least implicitly, although they might ultimately determine prices on the basis of some cost accounting rules. Shapiro and Sawyer (2003) went even a step further and argued that such a thing as cost-based price cannot exist. Their statement is grounded in the notion that objective full-cost benchmarks do not exist; therefore mark-ups and cost allocations are always essentially based on a subjective assessment of the expected market and competitive environment. In practice, people may be compelled to make cost allocations based on, for instance, a product's relative ability to bear costs, instead of on genuine reasons for these costs. Smith (1995) acknowledges that pricing probably always features shades of various methods, and discussed rather different managerial pricing orientations. He defines managerial pricing orientation as "…the pattern of policies, activities, and behaviors that business units typically engage in with regard to information gathering and processing; objectives, decision rules and beliefs; organizational decision processes; and organizational responsiveness relating to setting or changing price". Therefore, there are differences in the way in which managers conceptualize the meaning of pricing, which is reflected in the actual decision-making processes. For example, cost-oriented managers may primarily view prices as a financial mechanism to achieve unit profitability, while sales-oriented managers more likely see them as a means to consummate the sale. As a consequence, cost-oriented managers are likely to place greater emphasis on financial calculations that ascertain profitable sale, while sales-oriented managers may focus more readily on customer retention. Fundamental pricing orientations and their key characteristics are described in Table 6. In addition to the orientations already discussed, Smith (1995) includes a strategic-oriented approach in his categorization.

Table 6. *Managerial pricing orientations (adapted from Smith 1995).*

Dimension of pricing orientation	Cost-oriented	Sales-oriented	Competitor-oriented	Strategic-oriented
Information gathering and processing	Variable costs, fixed costs, overhead burdens	Current sales relative to last period's sales, sales by account or market segment, customer complaints regarding price, lost customers, trade	Competitors' prices, competitor market shares, competitor signals, competitos capital investments, financial analyses of competitors	Variable costs, contribution margins, total contribution, customer response, competitive response, regulatory response
Pricing objectives, philosophies and beliefs	Financial prudence philosophy. Unit profitability variances in costs, revenues or profits ROI, ROA, ROS, ROE	Sales-oriented philosophy: price reflect what customers are willing to pay; consummate the sale	Competitive weapon philosophy: price to meet or beat competitors; defend market share; market share leads to profitability	Philosophies: sustain competitive advantage; customer value; segmentation pricing Price stability; LT industry and SBU profitability
Organization decisions process	Accounting/finance functional competence; formalized, centralized process; little departmental connectedness; moderate interfunctional conflict	Sales-functional competence; less formal, decentralized process; little interdepartmental connectedness; high interfunctional conflict	Marketing functional competence; more formal, centralized process; some interdepartmental connectedness; moderate interfunctional conflict	Integrated decision process; formalized centralized process; high interdepartmental connectedness; low interfunctional conflict
Organizational responsiveness	Inflexible, slow response to market changes; planned but narrowly focused response	Flexible, quick responses to market changes; unplanned, unfocused response	Flexible, moderate response to market changes; unplanned, reactive response	Relatively inflexible, slow response to market changes; planned, integrative assessment of response

Several attempts to combine different pricing methods (or rather, different perspectives) under a single normative framework to guide price-setting have also been made. One such framework is provided by Smith and Nagle (1994), and highlights the need to assess different sources of information in the light of broader marketing strategy and objectives. The method begins with a financial sensitivity analysis (i.e., internal costs), whereby information regarding cost structure (i.e., variable and fixed costs) is used to assess how changes in prices affect a product's profitability. The next step involves more subjective analysis of external market forces, and the need to focus on the expected customer and competitor reactions is particularly stressed. Ultimately, a fit to broader managerial strategy is assured by analyzing whether the pricing decision leads to market opportunities that are consistent with the firm's core competencies. Hinterhuber (2004) presents a conceptually fairly analogous framework, but focus more profoundly on specific tools that can be used to examine and integrate these different perspectives. The economic value analysis (used to assess market perspective) and the cost-volume-profit analysis (used to assess cost perspective) are discussed in particular detail. The cost-volume-profit analysis is conceptually close to break-even sales analyses, which all essentially attempt to circumvent the difficulties in directly determining the price elasticity of demand. As Diamantopoulos and Mathews (1993) argue, even though managers may experience difficulties in directly estimating demand elasticity, they are quite successful in determining whether certain sales change is attainable. Furthermore, Shipley and Jobber (2001) provide a model that incorporates many similar features, but they place greater emphasis on the general connection between pricing decisions and the overall business strategy. Despite the small differences between these various normative pricing frameworks, researchers appear to have approached a consensus whereby successful pricing always lean on careful analysis of multiple information sources.

2.2.3. Different cost concepts and provision of decision relevant costs

The provision of cost information for pricing and product mix decisions is widely recognized as being one of the key functions of management accounting and product costing systems. The content and nature of appropriate cost information is still discussed. The concept of “decision-relevant costs” is commonly used in the accounting literature, and essentially implies that decisions should be based on the calculations of incremental cash flows for each period covered by the decision (Lucas 2003). Although the decision-relevant costs should essentially also include opportunity costs, they usually take the form of “avoidable costs” in the accounting literature, meaning that only the costs that actually change if an alternative course of action is taken should influence the decision-making (Shillinglaw 1963). In principle, this approach applies to any planning-time horizon, and therefore both short- and long-term consequences can be considered when examining alternative courses of action (Drury & Tayles 1994). The concept is nevertheless normally applied to short-term decisions, by assuming that fixed costs remain constant independent from the decision that is made. Although variable costs are commonly based on outlay costs and historical cost records (i.e., they do not take into account forgone benefits or replacement of resources), they are seen to closely parallel the concept of marginal costs in short-term decisions (Nagle et al. 2011). In principle, total variable costs should be close to the sum of marginal costs over all the units that are produced, so the unit variable cost, reported by many product costing systems, represents the average marginal costs of production. The advocates of the variable/direct costing approach fear that any allocation of fixed costs would lead to distortions in the decision-making, since these costs cannot actually be avoided. For example, companies using full-cost figures might not identify the profit potential related to disposal of obsolete stock with prices above the variable costs, but under the average costs (Shipley & Jobber 2001). However, the proponents of full-costing are equally concerned that the simplistic division between variable and fixed costs might lead to unjustified exclusion of fixed costs when they are truly relevant. As already pointed out by Clark (1923), whenever a decision involves overhead expenditures that could otherwise be avoided, these expenditures are considered to be decision-relevant.

Since costs are commonly classified as a variable only if they change linearly in relation to short-term fluctuations of output volume, many authors have questioned the adequacy of this short-term perspective with regard to decision-making. Shillinglaw (1963) has elaborated on the concept of short-term fixed costs further to better reflect the long-term consequences of decisions. He makes the distinction between divisible and indivisible fixed costs, which can either be product- or function-traceable, or common to both. This basic behavioral pattern of short-term fixed costs is depicted in Figure 6.

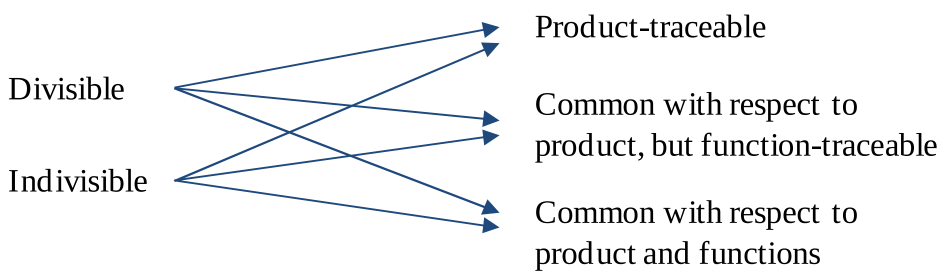


Figure 6. *The basic behavioral pattern of short-term fixed costs (Shillinglaw 1963).*

Shillinglaw (1963) defines divisible fixed costs as those costs that actually behave like variable costs if the change in volume is large enough. For example, the salaries of sales assistants are typically classified as fixed, but they can actually be reduced in proportions (given that there are more than one of them) if required. Johnson and Kaplan (Johnson & Kaplan 1987b) has subsequently more provocatively stated that if there is any more than one of any resource, it has got to be a variable cost resource. As a result, costs of such resources should be classified as decision-relevant when choices regarding larger increments and longer time periods are made. Shillinglaw (1963) makes a further distinction on the basis of the traceability of costs, arguing that when the entire existence of a certain product or function is questioned, the indivisible product- or function-traceable cost is respectively also decision-relevant. On the basis of this classification, Shillinglaw (1963) proposes that the alternative cost concept of "attributable cost" should be used in decision-making. Attributable costs would include short-term variable costs, divisible fixed costs and indivisible traceable costs, since all these costs would eventually change based on the decision. Ideologically, the concept of attributable cost represents the mean cost per unit that can be avoided if a product or process is entirely discontinued without altering the rest of the firm's cost structure (Bromwich 2007). It can be viewed as a progenitor of long-term incremental cost concepts, but has not received wide attention in the literature or among practitioners. Many authors and practitioners have instead adopted a view that almost all costs are eventually divisible (and traceable) in long-term decisions.

Cooper and Kaplan (Cooper & Kaplan 1988a) has argued that companies rarely make any decisions that have implications only for the next month or quarter, rather, almost all important decisions generate long-term commitments to resources. As a consequence, product costing systems should not be aligned to measure short-run marginal costs, but instead to approximate long-term cost implications of producing each product (Johnson & Kaplan 1987b). Cooper and Kaplan (1992) states that the conventional fixed versus variable cost classification actually arise from an attempt to classify the likely change in spending or supply of a resource. For resources that are acquired as needed (e.g., materials), the cost of resources supplied generally equals the cost of resources used (i.e., they are classified as variable costs). On the contrary, for resources that are acquired in advance of usage, the costs of resources supplied are incurred independent of their usage (i.e., they are classified as fixed). While the cost of supplying these resources (i.e., the spending) may be fixed in the short-term, the quantity of resources that is actually used fluctuates on the basis of the volume of activity outputs (Cooper & Kaplan 1992). This difference between the supply and use of resources is considered as unused capacity, which can be affected by making decisions that balance the demand with supply of resources or change the level that is supplied in forthcoming periods.

Therefore, there is nothing intrinsically fixed in the costs of already acquired resources, but the failure to reduce these costs is the consequence of managers being unable or unwilling to exploit the unused capacity they have created (Cooper & Kaplan 1992). Johnson and Kaplan (1987b) points out that the share of fixed support department costs have been among the fastest growing in the overall cost structures of manufactured products. Therefore, these costs must essentially be variable, although not necessarily in a linear relationship with the output volume; that is, costs should not be treated as fixed simply because they fail to change together with short-term fluctuations in output volume (Cooper & Kaplan 1988b).

On the basis of survey evidence, it seems that many practitioners have rejected the short-term view on product costs and have adopted pricing practices utilizing full-costs (Govindarajan & Anthony 1983). This represents a view that a firm’s management has almost complete control over its labor and overhead resources, and the historical costs of providing these resources can be meaningfully apportioned and allocated to various products (Baxter & Oxenfeldt 1961). Although these cost allocations clearly always provide average and not marginal costs figures, the resulting cost figures are argued as better reflecting the long-term cost implications of product-related decisions. Noreen (Noreen 1991) studied the possibilities of costing systems with overhead allocations to actually provide estimates of decision-relevant costs (i.e., avoidable costs), and identified several necessary and sufficient conditions under which costing systems are capable of providing relevant costs for a given set of input prices. These conditions would, for instance, rule out all nonlinear cost functions and dependencies between products (e.g., joint processes) in the production processes (Noreen 1991). Bromwich and Hong (1999) extended Noreen’s work by identifying additional conditions that are placed on accounting systems, technology and input prices. These conditions further rule out all economies and diseconomies of joint production (i.e., costs of activities must need to be equal whether performed separately or together), variability of input mixes for a cost pool (i.e., input mix is not dependent on activity volume) and economies of scope within and between each cost pool. Moreover, a perfect market for inputs is required to ensure that input prices do not vary in relation to output volume (Lucas 2003).

Both Noreen (1991) and Bromwich and Hong (1999) concluded that the necessary conditions placed on the provision of relevant costs are seldom met in practice. However, the important question is not whether any cost accounting system can accurately reflect the marginal costs, but rather to what extent the costs provided by full costing systems differ. The difference between the two cannot be directly measured, but the central assumption of proportionality between the costs of cost pools and the volumes of activity drivers can be empirically examined. Noreen and Soderstrom (1994) have studied the proportionality of overhead costs to activities in the hospital industry. They found that the average cost per unit of activity overstates marginal costs on average by 40% and in most extreme cases by over 100%. In a further study, Noreen and Soderstrom (1997) concludes that on average only around 30% of the overhead costs appeared to be variable, and more accurate predictions of cost changes could usually be made by assuming that the costs would not change at all (with the exception of inflation). The changes in costs are not either symmetrical to increases and decreases in the level of activity output. On the basis of the empirical data concerning the selling, general, and administrative costs in over 7000 firms over a period of 20 years, Anderson et al. (2003) show that these costs increase by an average of 0.55% per 1% increase in sales, but decrease by only 0.35% per 1% decrease in sales. When considered together, it seems reasonable to conclude that overhead costs are rarely strictly proportional to activities in real-life settings. In practice, this means that average full-cost figures cannot be interpreted as closely approximating avoidable costs, even in long-term decisions. Therefore, cost estimates generated using an averaging process should be used with caution in decision-making (Noreen & Soderstrom 1994).

2.2.4. Use of cost information in pricing

Given the issues regarding 1) the importance of cost information in pricing in relation to other information sources and 2) the content and nature of appropriate cost information, the use of cost information in pricing has stirred continuous debate among pricing researchers from different disciplines. The usefulness of straightforward cost-based accounting rules in price-setting is especially constantly questioned, since these rules are not capable of accounting for other potential sources of information (Shipley & Jobber 2001). However, there is a major difference between the use of cost information in pricing and the determination of prices solely based on cost information. With regard to the latter, there now appears to be sufficient empirical evidence to conclude that companies rarely use strict cost-based pricing rules, in the sense that prices are derived solely from cost information (Skinner 1970). Companies still appear fairly unanimous in their belief that cost information has great potential to improve their pricing decisions. Foster and Gupta (1994) reported that marketing managers perceive cost information as being valuable in marketing-mix decisions in general, and potentially most valuable in pricing decisions (among 12 specific marketing decisions). Managers also indicated that the current costing systems are not very successful in supporting pricing decisions, and there are considerable problems, for instance, with the reliability and availability of cost information. There have subsequently been many surveys providing more empirical evidence regarding the importance and nature of cost information in pricing decisions.

Despite the wide potential gap described by Foster and Gupta (1994), most companies appear to use cost information in their pricing decisions. Schoute (2009), for example, has reported that over 95% of medium-sized Dutch manufacturing firms use cost information in their pricing process. More specifically, pricing was the most frequently mentioned purpose of use for a product costing system, followed by budgeting and stock valuation. In a similar study among British ABC adopters, Innes and Mitchell (1995) found out that around two thirds of adopters used ABC for pricing purposes and more were planning to do so. Pricing was also rated as the most important, and third frequent, purpose of use for a product costing system. In a comparative survey conducted 5 years later by Innes et al. (2000), both the frequency of use (80%) and the importance rating had increased from the previous study. While these studies do not take a stand on the importance given to cost information in pricing, other studies have attempted to classify companies on the basis of the principal source of information that they use in pricing (c.f., Table 6). Shim and Sudit (1995) report that over 80% of manufacturing companies use cost-based pricing, while only 18% use market-based pricing. Indounas (2006) extends these finding to the service sector, finding that cost-plus methods are also the most popular pricing methods among industrial service firms. However, the meaning of cost-based pricing is questionable, and multiple studies already described point out that companies regularly adjust their mark-ups based on the market environment (Skinner 1970). It still appears reasonable to conclude that almost all companies use cost information in their pricing decisions in one way or another.

As stated, surveys indicate that a considerable amount of firms use pricing practices that set initial prices equal to unit cost plus target profit/contribution. A large scale survey conducted by Govindarajan and Anthony (1983) provide further information concerning the actual use of different cost bases for pricing purposes. The data show that over 80% of large American Fortune 1000 industrial companies used full-cost information in their pricing decisions, while fewer than 20% used variable cost information. In a comparable study by Shim and Sudit (1995), the share of full-cost pricing was around 70%, while only slightly more than 10% of respondents used variable cost-pricing (the remaining 20% were reported to use market-based pricing). On the basis of these studies, it seems reasonable to conclude that the companies use some form of full-cost information, rather than variable cost information, in their price-setting. However, Drury and Tayles (1994) point out that companies might use these cost bases flexibly and analyze the essential pricing decisions from multiple perspectives. Therefore, the use of full-cost information does not rule out the option that variable cost information is also used to support decisions. The authors also provide some evidence of this type of flexible use of different cost bases by showing that only 8% of all the respondents used a full-cost approach and never/rarely used variable costs (Drury & Tayles 1994). With regard to the wide use of full-cost figures, Govindarajan and Anthony (1983) conclude that managers appear not to follow the profit maximization model stemming from neoclassical economics, but rather search for a satisfactory alternative and move on to the next problem.

While full-cost pricing indicates only the existence of some fixed cost allocations, there is considerable leeway for the use of different cost bases under this common denominator. The majority of the accounting literature appears to be concerned only with the allocation of manufacturing overheads, supposedly because the accounting regulations state that non-manufacturing overheads should not be allocated to products (Drury & Tayles 1994). Companies might still decide to also allocate non-manufacturing overheads to products for internal decision-making purposes (Reinstein & Bayou 1997). Both Govindarajan and Anthony (1983) and Shim and Sudit (1995) report that almost exactly half of the companies studied (within the group that used full-cost pricing) based their pricing decisions on total manufacturing costs, while the remaining half also included non-manufacturing overheads in the product cost calculations. Therefore, many companies appear to adopt the view that almost all costs are eventually affected by product-related decisions and these costs can be meaningfully allocated to products (Baxter & Oxenfeldt 1961). Drury and Tayles (1994) report similar findings, together with evidence that companies might use both total manufacturing costs and total costs (including fixed non-manufacturing overheads), depending on the decision-making situation at hand. The authors also point out that around 90% of the companies used historical cost depreciations instead of replacement costs (Drury & Tayles 1994), which is consistent with the findings of Govindarajan and Anthony (1983). The historical depreciation costs are commonly held as sunk costs, which should not be accounted for in decisions concerning the future. Rather, companies should focus on the replacement costs of plants, since they will be realized in the future and better represent the opportunity costs for producing products (Baxter & Oxenfeldt 1961).

The apparent prevalence of full-cost pricing underscores the importance of appropriate cost allocation methods in the design of product costing systems. It suggests that accurate cost allocations help to convey a more truthful image of the implications of pricing decisions, which is further reflected in the organizational performance. Shim and Sudit (1995) even partially explain the persistence of full-cost pricing methods as the effect of ABC, which is assumed to provide more accurate product cost estimates for the basis of price determination. On the contrary, other authors have even proposed that instead of allocating all costs to products, the system focusing solely on the direct material costs (i.e., the theory of constraints focusing on maximizing the throughput in relation to certain constraint) might lead to more profitable product-mix and pricing decisions (Kee & Schmidt 2000). The theory of constraints has been suggested as an alternative to ABC, with regard to short-term pricing decisions in particular. There is still very little hard evidence as to whether and to what extent actual prices are affected by cost system design choices. Early experimental studies provided evidence that managers become "functionally fixated" on the output of accounting systems, meaning that they heavily rely on the figures reported by these systems (e.g. Ashton 1976, Barnes & Webb 1986). As a consequence, the choices over the cost bases were important and full costing practices were reported to lead to systematically higher prices, than did variable costing practices. Waller et al. (1999) nevertheless criticize these studies for investigating the effects of cost information (variable vs. full costing) in isolation and for not incorporating market features as a part of cost-based decisions. In their experiment, authors show that pricing biases that originate from different costing practices do not last if there is an opportunity to learn from the profit and market feedback. Therefore, the choices regarding cost bases have a direct impact on the initial price setting, but sellers rapidly revise their prices toward the optimum with no regard for signals provided by the costing system. Cardinaels et al. (2004) subsequently pointed out that market feedback might also involve a considerable amount of noise, and more accurate cost information may provide benefits even in highly competitive markets. Overall, there appears to be no consensus as to whether, and to what extent, choices regarding cost accounting systems actually affects pricing decisions.

2.2.5. Alternative roles of cost information in pricing

The vast majority of pricing research views the role of cost information as a kind of answer machine (c.f. Burchell et al. 1980), which is used rather mechanistically in operational price setting. For example, the discussion around cost-based pricing and associated calculation rules stands as a proof of this perspective. There is also a wide stream of research focusing on price optimization, as based on the modeled cost and demand functions under various market structures and other constraints. The common denominator is the belief that if the costing system is properly configured, it provides a more truthful image of the real cost implications, which is further reflected in improved pricing decisions (see e.g. Lere 2000). Shipley and Jobber (2001) argue that two important cost measures are relevant in pricing; the direct (i.e., variable) and average (i.e., variable plus proportion of fixed) costs of products, which accordingly determine the short- and long-term price floors. This view is shared by many other researchers, but it is rarely argued through what kind of mechanisms this information actually help managers to make better pricing decisions (other than giving a certain artificial minimum price). In a similar manner, the articles discussing the benefits of using ABC in pricing appear to assume that the more accurate product cost figures will automatically lead to better pricing decisions. Lere (2000), for instance, simply shows that different costing systems will result in different cost estimates regarding certain orders, basically assuming that improved congruence (i.e., higher costs, higher prices) between the costs and prices will improve the organizational outcome. A similar assumption is in the background when it is claimed that the apparent prevalence of full-cost pricing (i.e., a fixed relationship between costs and prices) underscores the importance of appropriate cost allocation methods (Drury & Tayles 1994). It remains unclear how the information that one customer is allegedly more costly to serve than another will eventually enable the decision-maker to make better pricing decisions. If the answer is simply that the price of such an order can be raised on the basis of this information, then the decision should be made regardless of cost information. Nevertheless, the problem is not that these approaches would be invalid as such, but rather the fact that other potential roles of cost information have rarely been identified or discussed in the literature.

Burchell et al. (1980) divided the role of accounting information in decision-making into four distinct categories, depending on the level of uncertainty over the objectives of the decisions and the uncertainty over causes and effects among the key business phenomena. Given that new product pricing in particular is usually made with limited information regarding demand, costs, competition, and other variables that may affect success (Monroe & Della Bitta 1978), at least the uncertainty related to causes and effects is commonly present in pricing decisions. This highlights the potential role of accounting information as functioning as a “learning machine”, through which it is possible to learn from the complex decision-making situation and reduce perceived uncertainty (Burchell et al. 1980). Chapman (1997) opens up this role proposing that accounting may provide information from the financial impact of decisions, so that if not the best, then at least better decisions about the action can be made. According to Wouters and Verdaasdonk (2002), the strength of accounting information lies in its ability to transform different operational consequences (e.g., number of units produced, capacity utilization, inventory levels, lead-times of processes, etc.) into a single unit of measurement, which enables the meaningful comparison of alternatives. Different ad hoc analyses, what-if models, and sensitivity analyses represent the use of accounting information in this manner. In the pricing literature, the tools that use the division between fixed and variable costs as a means to understand the dynamism of price change situations, are especially commonly discussed (Smith & Nagle 1994, Hinterhuber 2004, Indounas 2006, Smith 2006). For example, the analysis of gross margins may help to understand the appropriate pricing strategy (Smith 2006) while the break-even sales analysis can be used to learn from the minimum requirements that a given price change is yielding a positive contribution (Hinterhuber 2004).

The framework provided by Burchell et al. (1980) also hints that accounting information may sometimes be used to justify the decisions ex post rather than inform them ex ante. This kind of behavior can be expected, especially in the social settings in which others will be evaluating the decisions that are made. Indeed, Edwards (1952) recognized this by arguing that costs are used to justify pricing decisions that have already been made in reality. Urbany (2001) further researched the concept of accountability and the way in which pricing decisions are justified in organizations, stating that the justification of pricing involves the search for criteria that are used by others to judge the decisions, and decision-making that can be rationalized on those criteria. The decisions that are easy to justify and rationalize are those that 1) are consistent with previous practice, 2) are made relative to competitor reference points, and 3) are based upon unambiguous or familiar data/criteria (Urbany 2001). While cost information is usually perceived as familiar, concrete and unambiguous when compared to competitor reactions or customer valuations, it provides a good basis for defending pricing decisions within the company. Cost information may also provide the means to justify the pricing decisions for customers, by showing how additional customer requirements inevitably incur costs that could otherwise have been avoided (Lere 2000). The ability of companies to “sell” new prices to customers is especially required when there are sudden or major price changes (Dutta et al. 2003). This is also likely to have severe financial implications, since if the price changes are not perceived as fair, the company risks losing some long-term customer relationships. Kahneman et al. (1986) have demonstrated that price increases justified by current or past cost increases are, in general, perceived as fair by the customers. Therefore, the price increases that are motivated by “profit protection” are likely to meet less resistance, which creates an incentive for companies to establish reliable costing practices (Herman Diller 2008).

It is also possible to approach the role of cost information in pricing from a more strategic perspective. This view is implicit in the concept of management control systems, which have been broadly defined as a set of devices and mechanisms that intend to contribute the achievement of organizational objectives by influencing the behavior of actors within an organization (Speklé 2001). According to this view, managers may use cost information and cost accounting systems as devices to purposefully guide the desired action in their organizations. Simons (1994, 1995) has proposed that managers use control systems as levers of strategic renewal by 1) communicating and enhancing what is perceived to be important in the organization (i.e., belief systems), 2) setting restrictions for undesired behavior (i.e., boundary systems), 3) monitoring the organizational performance and variances (i.e., diagnostic systems), and 4) actively taking part in organizational processes and decision-making practices (i.e., interactive control systems). In the context of pricing, established practices used to analyze the economic viability of new products may help managers, for instance, in aligning the various departmental objectives, simultaneously ensuring a decision-making process that is in line with the company’s long-term strategic goals. The concept of management control system has also broadened during recent decades and it currently embraces the need to support internal financially quantifiable information with external “predictive” information related to markets and competitors (Chenhall 2003). This view is shared in the strategic management accounting literature, which highlights the need to adopt a strategic view on accounting and to produce information regarding a business and its competitors for use in developing and monitoring business strategy (Kim Langfield-Smith 2008). With regard to pricing, Simmonds (1982) has proposed that the use of cost information should not be restricted to internal cost-volume-contribution calculations, but that comparative costs, volumes and profits of direct competitors should also be addressed. Despite the potential to analyze the industry-wide strategic implications of pricing decisions through this kind of costing practices, Lord (1996) criticizes the suggestion of displaying competitors’ information in an accounting format on the basis that it is highly speculative and probably not justifiable on a cost-benefit basis.

Institutional writers have also proposed that accounting practices can be understood as customs or institutionalized rules that facilitate and maintain conformity across organizations (DiMaggio & Powell 1983). According to this interpretation, the use of cost information in pricing may help to constitute tacit collusions that provide order and stability within the industry. If all the firms in the industry adopt similar cost-based pricing approaches, the end result is likely to be rather similar prices and drastically reduced price competition (Lucas & Rafferty 2008). There is also some empirical evidence from such "implicit contracts" and the existence of large industrial sectors, which are rather characterized by price stability than price competition (Hall et al. 2000). In accordance with the behavioral theory of the firm (Cyert 1963), the use of cost information in pricing might similarly provide a means to create order and balance within the firm. Therefore, the cost-based pricing practices can be seen as simplifying rules of thumb that help managers to attain satisfactory results for highly complex problems with limited resources. Simple routines, or standard operating procedures, reduce the complexity of real-world decisions to manageable levels by limiting the number of variables that must be considered (Ahmed & Scapens 2003). Moreover, cost-based rules and routines may provide an important boundary system (Simons 1995) to control the actual implementation of pricing decisions. By setting cost-based pricing rules it is possible to limit the feasible price range of pricing decisions, which may help to align pricing practices among the salespeople. Without effective controls, the delegated pricing responsibility may lead to a wide range of practices and unnecessary discounts that are given to avoid the work or time involved in customer problem-solving (Brennan et al. 2007).

2.3. Product costing systems and their design principles

2.3.1. Evolution of cost accounting

Although there is considerable evidence of the existence of scribes even in early Babylon, the rudiments of basic modern management accounting practices were established during the period from 1400 to 1600 (Atkinson et al. 2004). The methods used in those times were of course fairly crude compared to their modern equivalents, but nevertheless shared many operational principles and purposes of use that still prevail today (Garner 1947). The real evolution of modern management accounting techniques started in the wake of the Industrial Revolution, during the first half of the 19th century. By then, textile mills and railroads in particular had grown sufficiently large and complex to require separate internal accounting information to evaluate and control their multiple products and subunits (Kaplan 1984). The primary focus was on the cost side of the operations, and typical performance measures consisted of different efficiency ratios depicting, for instance, the conversion of raw materials into a variety of finished goods (Johnson 1972). By the end of that century, these internal accounting reporting systems had spread to other rapidly developing industries, especially the mass distribution and mass production enterprises (Kaplan 1984). Common to all these early management accounting systems was the almost exclusive focus on the assignment of labor and material costs of production, although some texts and journals already contained discussions on the allocation of fixed operating costs (Kaplan 1984). Therefore, in modern terms, these accounting systems would be labeled as direct costing systems, without any fixed cost allocations either to products or periods (Reinstein & Bayou 1997). The impetus for overhead cost measurement and allocation (i.e., the factory burden) was provided in the early 20th century by the advocates of the scientific management movement, who were determined to measure the unit costs of products even more accurately (Kaplan 1984). As Church (1916) illustrated, the early cost allocation bases included direct labor and materials, which have preserved their popularity to the present day. Although some people disagreed with these practices at that time, it was not until almost a century late that they were properly challenged.

The years between 1890 and 1920 can be described as the golden age of management accounting innovations. Especially notable was the contribution of the DuPont and General Motors companies, where many innovations including return on investment (ROI), market-based transfer price policies, target ROI pricing based on standard volume, and budgeting and planning cycles were formalized (Kaplan 1984). As Kaplan (1984) concluded, by 1925 the majority of the modern cost accounting theories and practices had already been developed and the years following were rather quiet in the field of cost accounting innovations up until 1980. However, the operational environments of companies fast developed to be more complex, with a wider range of products, greater customization and flexibility, computer-aided manufacturing, flexible manufacturing systems and just-in-time production, to name just a few of the change facilitators (Johnson & Kaplan 1987a). These changes gradually led to an increased proportion of overhead costs and more varying resource consumption patterns among products and processes, which started to highlight the shortcomings of the simplistic and arbitrary overhead allocation methods that were commonly used (Cooper 1988a, Cooper 1988b, Cooper & Kaplan 1988a, Cooper & Kaplan 1988b, Cooper 1989b). In other words, the share of costs requiring allocation increased simultaneously when the importance of their usual allocation bases reduced significantly. Moreover, the overhead costs of the modern production environment were no more directly related to output volume, but rather reflected the diversity of products and the complexity of processes (Armstrong 2002). In such an environment, traditional costing systems that first assigned costs to functional cost centers and then to products based on output volume-related cost drivers (i.e., direct labor hours, machine hours, material dollars etc.), were claimed to systematically distort the cost information provided for decision-makers (Cooper & Kaplan 1988a). In particular, the tendency of standard high-volume products to end up subsidizing customized low-volume products was commonly highlighted in the literature (e.g. Cooper & Kaplan 1988a). The rationale was that high-volume products absorbed the majority of overhead costs, which were, to a great extent, caused by the complexity of production and not the output volume. ABC was introduced in the 1980s to answer these emerging problems with the accuracy and relevancy of product cost information.

The principles behind ABC were originally independently simultaneously invented at several manufacturing firms, but the concept acquired wider attention through a number of articles published by Robin Cooper and Robert Kaplan in the late 1980s (Cooper 1988a, Cooper 1988b, Cooper & Kaplan 1988a, Cooper & Kaplan 1988b, Cooper 1989b). The basic premise of ABC is that products consume activities, activities consume resources and resources cause costs (Gunasekaran 1999). Therefore, by establishing the causal relationships between these fundamental building blocks of companies, it should be possible to more accurately reflect the overall resource consumption of products (Cooper 1988a). The cost assignment process of ABC is divided into two stages. In the first of these, resource cost drivers representing the reasons why costs in an activity cost pools change over time are used to assign the costs of resources to activities (Gunasekaran 1999). In the second stage, the linkages between activities and cost objects are established by using activity drivers describing the reasons why demand for activities changes (Cooper 1988a). These reasons may include common cost allocation bases, such as labor hours and material dollars, but also more complex relationships, such as number of parts or duration of set-up. The basic structure of ABC is depicted in Figure 7.

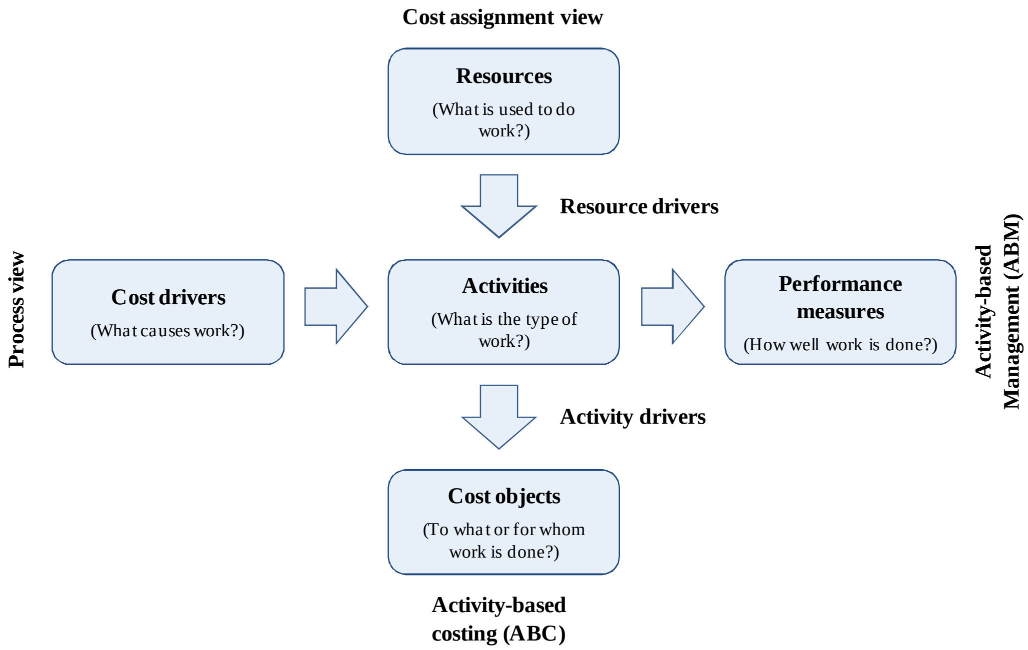


Figure 7. *The basic structure of activity-based costing (adapted from Gupta & Galloway 2003).*

The vertical axis in Figure 7 illustrates the traditional view on cost accounting, which is primarily interested in identifying the amount it costs to produce something. This view is labeled as a "cost assignment view" and the resulting cost figures are primarily used to analyze decisions such as pricing, product mix, and product sourcing (Gupta & Galloway 2003). When analyzed only through the structure of this two-stage cost allocation mechanism, ABC is actually characterized by only minor differences compared to so-called traditional costing systems (Noreen 1991). The most obvious difference is probably the focus on activities and processes instead of functionally defined cost centers. Other commonly indicated differences include the utilization of multiple cost objects and the use of resource- and activity drivers that are not associated with the output volume. Since the cost allocation bases used in traditional costing systems are claimed to be related only to product attributes, it is always the product that gets costed in the end (Cooper & Kaplan 1988a). In the correct design of ABC, costs are not forced on products, but are rather assigned to cost objects that cause the transactions to occur in reality (Sharman 1998). These may include products, but also batches, projects, customers, production lines, delivery channels, and market segments, among many other possibilities. In a similar manner, the activity drivers that are used to perform these cost assignments may be related to product attributes, but also, for example, to the delivery process or customer characteristics. Although these characteristics are commonly referred to as distinctive features of ABC systems, many European accounting researchers have pointed out that German cost accounting systems were already essentially characterized by the same features before the introduction of ABC (e.g. Sharman 2003, Friedl & Pedell 2005, Krumwiede & Suessmair 2008). Therefore, the real novelty value of ABC and its distinctive characteristics are still discussed in the literature. Conversely, it might be that the benefits of ABC are not as much related to structural differences, compared to other costing systems, as to the process of forcing the line managers to think of their business across departmental boundaries (Gupta & Galloway 2003).

The next step from the promise of more accurate cost assignment provided by ABC systems, was the logical extension of using cost information to control and improve the efficiency of activities incurring overhead costs (Armstrong 2002). Since people undertake activities that consume resources, the control of activities enables the control of costs at their source. This "process view" on cost accounting became labeled as activity-based management (ABM), which attempts to stress the importance placed on the management of costs. Therefore, the purpose of ABM is to affect the cost structure instead of simply adapting the behavior to the current situation (Kaplan & Cooper 1998). In a nutshell, ABM attempts to identify and analyze the genuine causes of costs and performance of activities and to use this information in order to identify sources for continuous improvement (Cooper & Kaplan 1992). At this point, it is essential to make a distinction between the activity drivers used to assign costs to cost objects and cost drivers reflecting the actual causes of costs. In an ideal situation, the causes of costs (i.e., the cost drivers) are naturally selected as activity drivers, but for all practical purposes one must select the activity drivers from multiple causes that affect the costs of activities. Therefore, for cost control and improvement purposes, a more profound analysis of the actual drivers of costs and their importance is usually required. While this level of detail is probably the major advantage of ABM systems, it might simultaneously be their biggest drawback. There is considerable evidence to suggest that many firms are experiencing major problems with the ABC/M implementation projects, and the most commonly referred to reasons for failure include the vast amount of work involved in setting up the system and collecting all the required data (Cobb 1992). Kaplan and Anderson (Kaplan & Anderson 2004) addressed these evident problems by laying out the fundamentals of a new costing approach labeled as time-driven activity-based costing (TDABC). The authors describe TDABC as a "new approach for implementing ABC that is simpler, faster, cheaper, more flexible and more easily maintained than the traditional approach". In TDABC, the costs of resources are not first assigned to activities and then to cost objects, but managerial judgments are used to directly estimate the resource demand imposed by each transaction, product or customer. In practice, there are no major structural differences between ABC and TDABC, it is only the nature of cost drivers that differs. Some authors have suggested even further refinements to TDABC (e.g. the contribution-based activity analysis suggested by Cleland 2004), but these new innovations have not attracted any significant attention. The majority of academic papers focusing on cost accounting issues are still published around the ABC/M.

2.3.2. General design choices of costing systems

The literature around cost system design principles is somewhat fragmented, consisting of some broad managerial books guiding practical design and implementation (e.g. Cokins 1996, Kaplan & Cooper 1998) and a huge amount of narrow research articles focusing on specific design issues. The fragmentation is partly due to the fact that there are many alternative forms of cost accounting systems and related concepts (e.g., standard costing, activity-based costing, resource consumption accounting, feature-based costing, job-order costing, process costing, target costing, life-cycle costing, theory of constraints, etc.), which are all characterized by their own specific design issues (Geiger 1999b). In order to make sense of the situation, it might be beneficial to first address some more general cost system design choices, and then focus separately on the specific structural issues of two-stage cost allocation systems. A natural starting point for cost system design is the notion that any design process must begin with the determination of management's needs, since the purpose of the costing system is to inform those needs (Geiger 1999b).Therefore, there is unlikely to be any universally superior costing systems, only systems that are more suitable for answering specific managerial needs under specific circumstances. Gorry and Scott Morton (1971) has argued that managers require wide, aggregated and future-oriented information outside the organizational boundaries for strategic planning purposes, while operational control needs are more inward-looking and specific. This view became adopted in the realm of costing systems when Kaplan (1988) famously argued that "one costing system isn't enough". Kaplan stated that, in principle, organizations should operate three different costing systems designed for three different purposes of use. These were (1) inventory valuation for financial reporting, (2) operational control, and (3) product cost measurement. Although Kaplan (1988) discussed the way in which the requirements placed on cost information (i.e., objectivity, frequency, scope, etc.) varied among these purposes of use, no clear linkage was made to the actual cost system design choices that are likely to affect these characteristics. Kaplan and Cooper (1998) subsequently argued that the strategic cost accounting system, focusing on the cost assignment view, may be operated with relatively few activities (20-60) while operational systems might require hundreds of activities.

Chenhall and Morris (1986) moved a step closer to actual design choices by analyzing the design of management accounting system in terms of several broad information characteristics, including scope, timeliness, level of aggregation, and integration. As the authors pointed out, for instance, the demand placed on timeliness (i.e., information characteristic) can be addressed by making design choices concerning the frequency and speed of reporting. More recently, Pizzini (2006) reviewed the literature around cost system design principles and concluded that the four critical attributes of cost system design are: the level of detail provided; the capacity to disaggregate costs according to behavior; the frequency with which the information is reported; and the extent to which variances are calculated. Although Pizzini (2006) did not make any explicit connection between these design principles and general information characteristics, it is easy to see that, for example, the level of detail is linked to the aggregation as understood by Gorry and Scott Morton (1971). More generally, the design choices presented by Pizzini (2006) clearly refer to the potential use of the system, so there is a rather obvious implicit linkage to specific managerial needs. The author states that the more "functional" cost systems are those that can provide greater detail, better classify costs according to behavior, report cost information more frequently, and/or calculate more variances. Mevellec (2009) makes a more explicit reference to the conceptual design of costing systems, by identifying five characteristics that can be used to classify these systems without addressing any inner "structural characteristics". Mevellec uses these five distinguishing characteristics to form a framework that identifies 10 broad types of costing systems. Although this framework is somewhat different when compared to those of Pizzini (2006) and Chenhall and Morris (1986), it can be used to structure the discussion around more general cost system design choices. In a similar manner, the conceptualizations made by Pizzini (2006) and Chenhall and Morris (1986) are also clearly different, but can be still used to discuss the general cost system design choices that must be made before the process of structural design can begin. An illustration of the framework provided by Mevellec (2009) is presented in Figure 8.

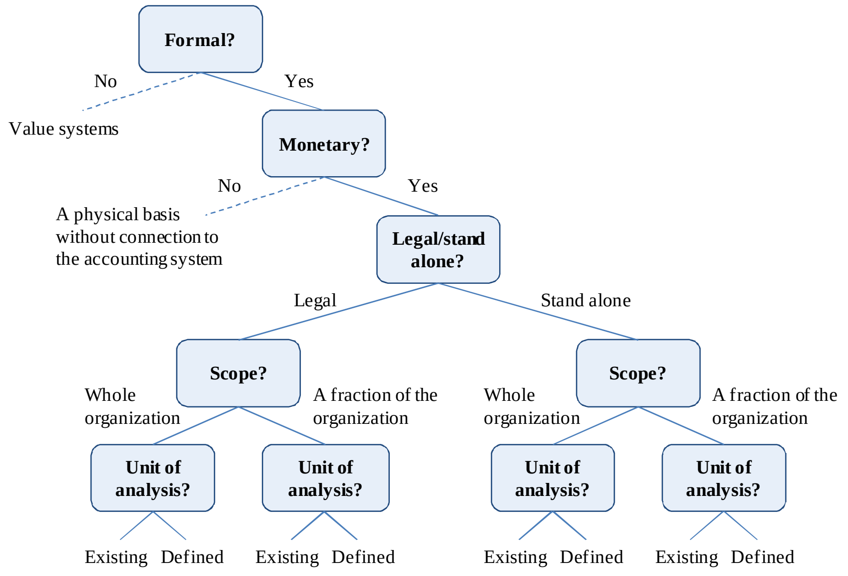


Figure 8. *The cost system cladogram (adapted from Mevellec 2009).*

The first and third classifying characteristics used by Mevellec (2009) are related to the question of the type of the cost accounting system. Mevellec (2009) first divides the costing systems into the categories of formal and informal, and then further classifies the formal systems into either legal or stand-alone systems. By legal costing systems, the author refers to the systems that are designed to meet only legal obligations. Stand-alone systems are parallel supportive costing systems, designed specifically for managerial decision-making purposes (Mevellec 2009). In practice, companies normally use a single formal system, but extract different kinds of information for different purposes of use (Drury & Tayles 2005). Therefore, a single costing system primarily used for financial reporting can also be designed to support managerial decision-making to some extent. In more general terms, managers must decide whether to attempt to address certain information needs by implementing a formal cost accounting system that is integrated to financial accounting, or whether to draw up only specific one-off calculations for the problem at hand. Therefore, the essential design choices include the decisions regarding the type of system and its principal purposes of use. Innes and Mitchell (1995) have identified nine different categories of decisions (e.g., pricing, budgeting, profitability analysis, etc.) that can be supported by product cost information. The particular information needs of these decisions can be answered by different types of costing systems, including embedded systems, stand-alone systems and ad-hoc systems (Pike et al. 2011). Embedded and stand-alone systems are more formal systems, which are typically designed to simultaneously address multiple purposes of use. The distinctive characteristic differentiating these systems is that only the embedded systems are fully integrated to financial information systems. Ad-hoc systems are specifically designed to meet a certain problem at hand, and represent the more informal side of costing systems, typically without any interfaces or integration to other systems. It is notable that the choice of type of the system to use is not a trivial one, since different types of systems have different characteristics. For example, embedded systems are superior in terms of automation and data integrity, but may lack the flexibility of ad-hoc systems (Pike et al. 2011). Moreover, the distinction between formal and informal is somewhat unclear, and all management accounting systems consist of both formal rule structures and informal routines (Lukka 2007).

The second classifying characteristic used by Mevellec (2009) is whether the system uses monetary or non-monetary information. Although Mevellec (2009) points out that cost systems that operate without monetary information may also exist, it might make more sense to ask whether the financial information is also supported by non-financial information. Chenhall and Morris (1986) use this type of classification, and state that broad scope management accounting systems will support financial information with a nonfinancial information. The same line of argument is also used to support the ABC systems, which are viewed as superior in providing non-financial information (e.g., defect rates and cycle times), compared to traditional costing systems (Gunasekaran 1999). Chenhall and Morris (1986) include this dimension to their characterization of scope of the system, which is also the next classifying characteristics proposed by Mevellec (2009). For Mevellec, the question of scope is related more to the perimeter of the costing system, specifically whether the system addresses the entire organization or only fraction of it. More generally, the question of scope is related to all the decisions regarding the borders of the system, including the departments, processes and costs that are included in calculations. Therefore, the essential design choices include decisions from the organizational borders (i.e., manufacturing costs versus all costs) and the behavior of costs (i.e., direct costs versus all costs) that are accounted for (Schoute 2009). The issue of manufacturing overhead allocation is particularly discussed in the literature, but Reinstein and Bayou (1997) actually identifies 13 different versions of product costing systems on the basis of these selections. Together they form the product costing continuum, whereby alternative systems vary from super-variable costing (only direct materials are included) to super absorption costing (even indirect administration costs are included). While the theory of constraints/throughput accounting usually traces only direct materials to products (i.e., all remaining costs are treated as fixed), ABC systems may even assign indirect administration costs to products and other cost objects. Chenhall and Morris (1986) also point out that the costing system may provide information outside legal organizational borders and may concern the future instead of the past, including these features in their conceptualization of scope. As Tillema (2005) consequently concluded, a broad scope management accounting system provides information that also refers to events outside the organization, is also quantified in non-financial terms, and focuses on both past and future events.

The question of scope is logically intertwined with the question of cost objects, since the decision to include only direct manufacturing costs in calculations hinders the possibility of assigning costs to some cost objects that would otherwise be relevant (i.e., customers). Geiger (1999b) defines a cost object as a "view of cost that is useful to management", implying that it actually includes the determination of what is meant by the cost. More commonly, the cost object is defined as anything for which measurement of costs is desired, referring more directly to entities that eventually get costed in costing systems (2012). The framework provided by Mevellec (2009) is not directly interested in the specific cost objects that are selected, but rather the ontological status of the basic unit of analysis. It makes the distinction between pre-existing and ad-hoc defined entities, arguing that while traditional costing systems are normally built on top of the pre-existing models of organization (such as bill-of materials and organizational charts), the activities used in ABC are defined from scratch during the implementation process. Since Mevellec (2009) views a cost system designer merely as a modeler of the organization, the choice is simply whether to rely on the existing models and their elements of analysis or to construct a new model with new elements of analysis. Regardless of the decision that is made, the specific cost objects must be selected among all the inputs, outputs, processes, actors, locations, and their combinations that are, in principle, potential cost objects in the system. In practice, the role of a product as an ultimate cost object is highly pronounced in many organizations, but customers, services and projects are also commonly named and used (Gunasekaran 1999). However, each of these entities can also be conceptualized in many different ways. For example, in process-costing systems, the ultimate cost object is the total amount of products produced in a certain period, while in job-order costing the ultimate cost object is a single product unit or unique combination of units (Horngren 2012). Therefore, the job-order costing system is capable of providing cost information specifically related to single units, while process costing is only capable of providing average unit cost figures. Moreover, the core product often includes some additional services that can either be separate cost objects or conceptualized as part of the product (Baxendale et al. 2006).

The cost object selection problem brings the discussion closer to the structural characteristics of the two-stage cost allocation mechanism, and is also related to the level of detail (Pizzini 2006) and aggregation (Chenhall & Morris 1986) characteristics, since the choice and definition of cost objects partially determines the possibilities of aggregating and disaggregating the cost information. The level of detail refers to the system's ability to supply data regarding cost objects that vary in size from entire divisions to individual products, components, and services (Pizzini 2006). Gunasekaran (1999) has stated that part number costing represents the most detailed cost object in product hierarchy. By aggregation, Pizzini (2006) refers to possibilities of disaggregating the information according to behavior. Basic cost classifications that are commonly discussed in the literature include fixed/variable costs, direct/indirect costs and controllable/non-controllable costs. Chenhall and Morris (1986) use aggregation also to describe the possibilities of presenting information in formats that are consistent with the standard decision-making models (i.e., discounted cash flow, cost-volume-profit analysis, etc.). Since the classification of costs into variable and fixed components is essential for cost-volume-profit analysis, there is clearly a linkage to aggregation, as understood by Pizzini (2006). Given that cost information is used for managerial purposes, there are also multiple alternative bases to measure costs and value assets (Baxter & Oxenfeldt 1961). For example, the valuation of materials might be based on the previous historical purchase price, some weighted average of historical prices, current purchase price, standard price, replacement price, etc. While the use of historical records might be essential for ex-post analyses, future-oriented standards might provide more relevant information when the purpose is to provide ex-ante cost estimations (Horngren 2012). Although these alternative valuation bases provide some possibilities for affecting the usefulness of cost information for decision-making purposes, empirical evidence suggests that the majority of companies value fixed assets, based on their historic cost depreciations rather than replacement costs (Drury & Tayles 1994). Regardless, the choices regarding the level of detail, cost classifications and valuation methods clearly affect the possibilities of using cost information in different decision-making situations. There would also naturally be many other general design choices regarding, for instance, the actual use of the system (e.g., frequency of reporting, speed of reporting, frequency of updates, application of imputed costs, etc.), but the discussion is now steered into the more specific structural design choices of two-stage cost allocation systems.

2.3.3. Structural design and errors of two-stage cost allocation systems

The structural design of two-stage cost allocation systems has been discussed far more than the more general design principles outlined in the previous chapter. The prevailing paradigm of structural design appears to stress the importance of accuracy as a guiding principle in cost system design (Alfred 1996). Although several other targets have also been discussed, statements such as "Designers of cost systems have to develop a system that leads to the most accurate information possible." (Pavlatos & Paggios 2009) are still rather common in the literature that describes cost system design choices. While it is commonly accepted that the accurate assignment of direct costs is somewhat trivial (i.e., it merely involves the implementation of a data-processing system to identify and record the resources consumed by products), the accuracy of indirect cost allocation especially has been discussed in the literature (Al-Omiri & Drury 2007, Labro & Vanhoucke 2007). In general, indirect costs are those costs that are not directly attributable to a product or some other cost object. The more accurate indirect cost assignment was also the essential promise of ABC, since it was introduced as a remedy for the diminishing accuracy of traditional costing systems. The advocates of ABC do not genuinely believe that overhead costs are truly indirect, but that the indirectness is an illusion caused by the complexity of causal relationships between the costs and cost objects (Armstrong 2002). By using multiple activities and hierarchical cost allocation bases, it is possible to reveal underlying relationships between costs and cost objects and consequently better reflect how various cost objects use organizational resources (Reinstein & Bayou 1997). However, virtually all the articles supporting the claims of its superior accuracy, demonstrate the improved accuracy simply by pinpointing the differences in cost figures provided by alternative systems (Dopuch 1993, Adams 1996). Since there are no real costs benchmarks against which the cost estimates can be measured, the evidential value of these results is somewhat questionable.

In their book "Cost & effect: using integrated cost systems to drive profitability", Kaplan and Cooper (1998) describe the development of the ABC system through four sequential design steps. Initially, the cost objects to which the costs are eventually attributed are selected. Second, the activity dictionary is created on the basis of the analysis of activities performed in the organization. Third, activity costs are calculated by using resource drivers to link the costs of resources to activities. Finally, these activity costs are assigned to cost objects by using various activity drivers. These same fundamental design steps are essentially included in all identified descriptions of the cost system design process (e.g. Ben-Arieh & Qian 2003, Gupta & Galloway 2003), although some models have also taken a broader process perspective and have included issues that are related to the implementation of costing systems. The description provided by Gunasekaran (1999), for instance, begins with a definition of the system's objectives, selecting the ABC team and addressing major organizational issues, but then arrives at the selection of cost objects, activities and drivers. Therefore, it seems justified to conclude that the structural design of two-stage allocation has primarily been discussed in terms of appropriate solutions for cost object, cost pool and resource/activity driver-selection problems. While the selection of ultimate cost objects determines the destinations of cost flows, other design steps relating to the number and nature of activities and associated drivers determine the structure of these flows. In practice, these decisions partially overlap, since the activities used to structure the cost flows from resources to cost objects are also important cost objects in their own right (Mevellec 2009). In order to further understand the nature of these design steps, a more profound analysis of the two-stage cost allocation process is necessary.

In any two-stage costing systems, costs are first collected into cost pools that can be defined on the basis of the organizational boundaries (i.e., departments) or the tasks that are performed (i.e., activities) in the company (Bromwich & Hong 1999). Since any process or activity can always be further disaggregated into smaller tasks, the selection of appropriate cost pools remains a key problem in the first allocation stage. Cost pools should be detailed and sufficiently homogeneous to convey an accurate view of resource consumption. When different products and services consume different activities in different proportions, a higher number of disaggregated cost pools, is likely to increase the system's ability to better capture these differences (Drury & Tayles 2005). However, the level of detail simultaneously increases the complexity of the system, which has often been reported as a major drawback of detailed ABC systems (Cobb 1992). In the second stage of the allocation process, the costs of activities are assigned to cost objects, based on pool charge-out rates and the activity amounts used by the cost objects (Bromwich & Hong 1999). Therefore, the cost allocated to cost object is determined by multiplying the amount of activity driver that is used (i.e., activity amount) by the unit cost of the activity (i.e., the pool charge-out rate). The aim of the activity driver selection in the second allocation stage is to find drivers that are significant determinants of the costs assigned to each cost pools (i.e., cost drivers or cause-and effect drivers). Since the factors that affect the demand placed on these activities vary considerably from one activity to another, a higher number of activity drivers is expected to increase the system's ability to better capture the actual resource consumption of each cost object. However, the distortions in two-stage costing systems are not restricted to the insufficient number of cost pools and activity drivers. Rather, these distortions may occur in either one of the two stages of allocation process and can have multiple potential sources. Datar and Gupta(1994) classifies these errors of cost system design as measurement errors, specification errors and aggregation errors. The error types and their potential sources in the two-stage allocation system are presented in Figure 9.

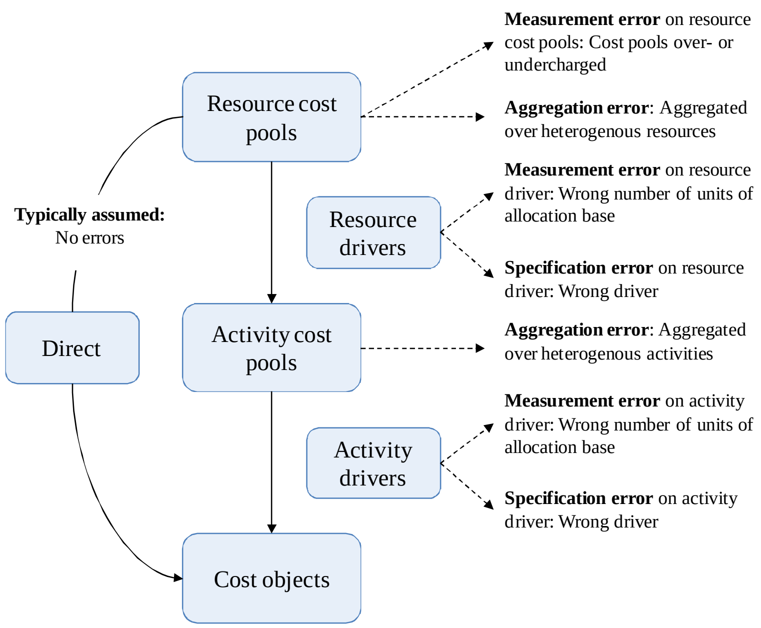


Figure 9. *Errors in cost system design (adapted from Labro & Vanhoucke 2007).*

There are basically three different types of errors in cost system design. Specification errors occur when the method used to identify costs to cost objects does not reflect the actual causal relationship between the two (Datar & Gupta 1994). As Labro and Vanhoucke (2007) points out, specification errors might relate either to resource drivers (i.e., when the resource driver does not reflect the demand placed on resources by activities) or activity drivers (i.e., when the activity driver does not reflect the demand placed on activities by products). For example, the allocation of batch-related set-up costs based on unit-related machine hours (commonly named as a distortion of traditional costing systems), can be seen as a specification error of an activity driver; i.e., the machine hours do not reflect the causal relationship between the units that are produced and the set-ups that are required. The second type of error is the aggregation error, which arises when heterogeneous resources or activities are aggregated into the same resource or activity cost pool (Labro & Vanhoucke 2007). If two activities with different cost drivers are pooled into a single activity cost pool, it is unlikely that any single activity driver is capable of correctly reflecting the demand placed on this aggregated activity (Datar & Gupta 1994). Empirically, aggregation and specification errors might cause similar distortions, but there is a clear conceptual difference as to whether the distortion is caused by the aggregation of dissimilar activities (i.e., there is no correct driver) or by the specification of the wrong driver (i.e., the wrong driver is selected). The final type of error is the measurement error, which refers to incorrect measurement of costs in resource cost pools, or units of allocation base in either one of the allocation stages (Labro & Vanhoucke 2007). At the resource cost pool level, the measurement error might occur when the cost of a marketing campaign is accidentally recorded as a delivery cost, leading to undercharging of the former and overcharging of the latter resource cost pool (Labro & Vanhoucke 2008). Moreover, the typical procedure of allocating staff time to different activities on the basis of interviews is clearly subject to considerable measurement error (Datar & Gupta 1994).

The existing literature around cost system design choices focuses on the second stage of the cost allocation mechanism (Labro & Vanhoucke 2007), and particularly the role of the aggregation error of activity cost pools (i.e., the number of cost pools) and specification error of activity drivers (i.e., the number and nature of cost drivers) are commonly addressed (e.g. Al-Omiri & Drury 2007). In general, a higher number of cost pools is expected to reduce the diversity within each cost pool, which reduces the likelihood of costs being averaged, leading to more accurate cost estimates (Brierley 2008). In a similar manner, the increased number of different cost allocation bases is likely to increase accuracy by better measuring the resource consumption of individual cost objects (Gunasekaran 1999). Although there is some evidence to suggest that the impact of second-stage errors on overall accuracy are generally greater than of first stage errors, the accuracy is always a combined effect of both stages (Labro & Vanhoucke 2007). Even if it were possible to design a costing system that could accurately reflect the demand placed on activities by different products, the product cost estimates would be distorted if the demand placed on resources by activities were inaccurately modeled. Moreover, the different error types are not independent of one another, and the overall accuracy of a costing system might not improve as a result of only partial improvements focusing on specific errors. As Datar and Gupta (1994) pointed out, the aggregation error of activity cost pools can be reduced by introducing additional cost pools, but this simultaneously increases the measurement errors relating to specific consumption of resources by different disaggregated activities. It is simply easier to estimate the time used for two basic activities instead of 20 more specific tasks which constitute these two activities. Labro and Vanhoucke (2008) has simulated the interactions among the errors and conclude that, although partial improvements to cost system design generally leads to improved accuracy, there are also some specific instances in which different errors have a clear offsetting effect and the overall accuracy is not improved.

Since many authors have concluded that costing systems are always prone to errors (e.g. Noreen 1991, Bromwich & Hong 1999), the research has provided both the optimization models (e.g. Babad & Balachandran 1993, Carsten 2001) and practical guidance (e.g. Kaplan & Cooper 1998, Geiger 1999a, Labro & Vanhoucke 2008) to solve the cost driver selection problem under specific circumstances. Although accuracy is an essential feature in majority of these models, the trade-off with other cost system characteristics has also been recognized. Cooper (1988b) already stated that the optimal costing system is not always the most accurate, but is the system that balances increased measurement costs with the benefits obtained from more accurate cost information. This implies that cost system implementation and operation are not costless tasks, and ultimately the desirability of increased accuracy depends on whether the associated benefits are evaluated as higher than the relevant costs (c.f. Prest & Turvey 1965 and principles of cost-benefit analysis). In a similar manner, the optimization model provided by Babad and Balachandran (1993) balances "savings in information processing costs with loss of accuracy". However, there is also an ever-growing consciousness that it is not only the measurement costs and accuracy that must be balanced. Geiger (1999a) points out that costing systems do not simply measure the costs and feed them to decision-makers, they also make an impact on the behavior of the organization in multiple ways. Therefore, the benefits of redesigning costing systems might not stem solely from the improved decision-making due to the increased accuracy. Hiromoto (1988), for instance, argues that part of the competitive edge of Japanese companies is related to the fact that they are not targeting the most accurate cost figures, but rather are aiming for those that are in line with their long-term strategic goals. Therefore, they might use direct labor hours to allocate manufacturing costs simply to stimulate people to increase the degree of automation (i.e., the benefit side of cost-benefit analysis might be highly complex). Merchant and Shields (1993) even identified some situations where companies might benefit by introducing purposeful biases into cost figures. Therefore, the cost driver selection problem cannot be solved only by simply balancing accuracy and measurement costs; the stimulated behavior must also be added to the equation. Despite the vast amount of literature concerning the cost pool and cost driver selection problems, Labro and Vanhoucke (2008) conclude that there is "little academic guidance available on how to (1) assess the quality of costing systems, (2) improve costing system's robustness to unwanted errors, and (3) identify situations where costing system refinement efforts […] are likely to pay off most in terms of increased accuracy".

2.3.4. Discussion around cost system sophistication

The discussion around cost system sophistication is tightly bound to the discussion around cost system design principles. The term "cost system sophistication" emerged into the cost accounting literature with the rise of ABC, although it had already been casually used in some earlier articles (e.g. Khandwalla 1972 discuss the sophisticated control systems). In the early articles advocating the benefits of ABC, the distinction was made between so-called traditional costing systems and sophisticated ABC systems (Cooper & Kaplan 1988b). Since the core difference between these two systems was the methods used to allocate indirect costs, the sophistication was at least implicitly related to number and nature of different allocation bases that were used to allocate indirect costs to products. However, the majority of early research studying the implementation of sophisticated costing systems did not concentrate specifically on these characteristics, but only on the dichotomy between traditional costing systems and ABC systems (Bjørnenak 1997, e.g. Gosselin 1997, Krumwiede 1998, Malmi 1999). The fundamental target was to reveal those conditions under which companies' judged the investments on sophisticated ABC systems worthwhile. Since these studies reported highly inconsistent results concerning the adoption rates of ABC, many authors began to question whether the systems described by survey respondents as ABC were genuinely ABC systems (Drury & Tayles 2005). Lukka and Granlund (2002), for example, hinted that practicing managers might be too eager to argue that the firm they represent applies ABC. Dugdale and Jones (1997) even provided some empirical evidence of this problem, by more profoundly analyzing the costing systems used by 12 companies that had claimed to use ABC for stock valuation purposes. They concluded that four companies did not use ABC for stock valuation, and of the remaining eight companies only three used ABC if the strongest definition of the term was applied. Given these difficulties in distinguishing between the traditional and ABC systems in practice, many authors have concluded that simple dichotomies cannot adequately describe various product costing practices that have been used in companies (Drury & Tayles 2005).

Recent studies have dismissed the simplistic dichotomy between traditional costing systems and ABC systems and have attempted to measure cost system sophistication on the basis of the central design choices that affect the system's ability to capture the resource consumption of different cost objects. The first study to adopt this new perspective into cost system sophistication was that conducted by Abernethy et al. (2001), which saw the cost system design choices vary along three central dimensions. These dimensions were number of cost pools (single versus multiple), nature of cost pools (activity cost pools versus responsibility cost pools) and types of cost allocation bases (volume-based versus hierarchical cost allocation bases). Together they formed a continuum for cost system sophistication, where so-called simple traditional costing systems are at one end (with a single responsibility-based cost pool and volume-based cost allocation base) and ABC systems are at the other end (with multiple activity-based cost pools and hierarchical cost allocation bases). The rationale behind including the number and nature of cost pools as determinants of a continuum can easily be understood through their alleged impact on accuracy, but it is more difficult to see why the ABC pools should be classified as being more sophisticated than the responsibility-based cost centers. Cost pools that are defined on the basis of activities clearly provide some benefits, but there is also some evidence to suggest that responsibility-based cost centers might be more suitable for control purposes (Friedl & Pedell 2005). Although the progress made by Abernethy et al. (2001) dramatically improved the operationalization of cost system sophistication, the essence of the conceptualization remained unchanged. The sophistication was still regarded as a synonym for the system's potential to provide accurate cost information, which was assumed to be related only to indirect cost allocation methods.

Encouraged by the study of Abernethy et al. (2001), also several other authors have attempted to better capture the essence of sophisticated cost systems. Drury and Tayles (2005) excluded the nature of cost pools from their list of essential cost system design choices, but simultaneously added the nature of cost drivers. By nature of cost drivers, the authors were referring to the classes of transaction, duration and intensity drivers (Kaplan & Cooper 1998). Transaction drivers are viewed as the least sophisticated category of drivers, while they represent only the number of times an activity is performed (Drury & Tayles 2005).Therefore, transaction drivers assume that an identical quantity of the same resources is required each time the activity is performed (Al-Omiri & Drury 2007). Duration drivers categorically represent a higher level of sophistication, while they attempt to capture the amount of time required to perform each activity. Intensity drivers do not only capture the differences in time required to perform each activity, but takes also into account the changes in resources that are needed. Therefore, they directly charge resources when an activity is performed, which makes them the most sophisticated class of driver (Kaplan & Cooper 1998). Drury and Tayles (2005) also mentioned the role of direct charging in the first stage of the allocation process, but omitted it from the final list of essential cost system design choices. Most recently, Al-Omiri and Drury (2007) explicitly included this feature in their set of criteria, stating that “higher levels of sophistication are also achieved by relying more extensively in the first stage of the allocation process on directly assigning costs to each cost pool or using cause-and-effect first stage drivers (i.e., resource drivers)”. Therefore, not only does the second stage of cost allocation process determine sophistication of costing system, but the methods used to gather costs from resources to cost pools are also important. Together these studies (Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007) suggest sophistication of costing system is determined by:

- Number of cost pools (single versus multiple)
- Nature of cost pools (activity cost pools versus responsibility cost pools)
- Number of different types of cost drivers (labor hours, machine hours…)
- Nature of cost allocation bases (volume-based versus hierarchical)
- Type of cost allocation bases (transaction/duration/intensity drivers)
- The extent of reliance on direct charging in the first stage of allocation process

To consider the existing studies together, it seems reasonable to conclude that sophistication of costing system is primarily associated with the number and nature of the cost pools and cost drivers that are used in indirect cost allocation (Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). Moreover, although Drury and Tayles (2005) pointed out that also simple costing systems may on some occasions be accurate, all the studies measured the number and nature of cost pools and cost drivers on the basis that they are good proxies to the system’s ability to produce accurate cost information. However, Drury and Tayles (2005) used actually a term complexity, rather than sophistication, although the terms were used almost interchangeably. The rationale behind using cost system complexity instead of sophistication wss two-fold. First, sophistication was perceived as being controversial and value-laden, which implicitly suggests that all organizations should pursue a higher number of cost pools and cost drivers. Second, the authors relied on the measurement of only two of the identified features (i.e., number of first-stage cost pools and number of different types of second-stage cost drivers) in their survey, and so perceived that cost system sophistication would also include other described factors. In their discussion, Drury and Tayles (2005) concluded that “…a more refined analysis should attempt to measure additional characteristics that may enable the costing systems to be classified by levels of sophistication rather than complexity”. Al-Omiri and Drury (2007) refer to the same difficulties in obtaining reliable data through mail survey, but also include some broad dichotomous categories (ABC versus traditional and direct versus absorption costing systems) to their measurement items. These inclusions likely cannot be interpreted as the only missing aspects of sophistication, but the authors nevertheless specifically discussed cost system sophistication once again (Al-Omiri & Drury 2007). Despite this confusion in terminology, it can be concluded that sophistication is generally perceived as a broader concept than complexity, both being simultaneously limited to the methods used in indirect cost allocations.

It is notable that all the articles discussed so far have attempted to define sophistication of costing system without any reference to practice. To be more specific, there is no specific definition for the construct, but the associated determinants clearly convey an image that accuracy of indirect cost allocation is the real-life phenomenon that is targeted. Brierley (2008) pointed out that the researchers might have actually indulged in tunnel vision by defining sophistication solely on the basis of the inclusion of indirect cost, and practitioners may not share this conceptualization. He attempted to provide some empirical evidence, by conducting questionnaire and field study interviews among British management accountants. Brierley (2008) discovered that the individual definitions provided by practitioners can be classified into three broad categories of definitions. One of these categories relates to the calculation of product costs (with a subset of indirect cost allocation), while the remaining two are associated with the use of product costs and the combination of these two. The three most-used individual definitions were: (1) the assignment of indirect overhead costs to product costs, (2) the inclusion of all costs in product costs, and (3) the understandability of product costs by non-accountants. The results suggest that sophistication cannot be used to describe only the structural elegance of the costing system, but should also include the aspect related to the usability of the cost information provided. This highlights that recently the sophistication of costing system has been used in describing the characteristics of costing systems that affect their performance. This was also a target for Abernethy et al. (2001), since the authors state: “The purpose of this paper is to contribute to the current debate on the efficacy of investing in sophisticated costing systems. We thus designed our study to explore factors influencing costing system design and collected data around the themes identified in the literature as relevant to the design of effective costing systems.” As a result, the concept of sophistication is both used, as a specific construct in contingency studies, and more generally to describe common features that are perceived to positively affect the performance of the costing systems. In both instances, the purpose of using the concept is to better understand the cost system design choices and their relationship to functioning of the system. In conclusion, Brierley (2008) calls for further research into the different aspects of sophistication and suggest that neither academics nor practitioners should use the term at this point.

2.3.5. Contingent view of cost system design

The contingent view on the study of organizations emerged during the early 1950s as a response to various management theories that emphasized one best way to organize companies (Weill & Olson 1989). In a general sense, contingency theories are a class of behavioral theory that share the belief that there is no one best way of organizing or leading a company, but that the optimal course of action is contingent upon the internal and external situation at hand (Fiedler 1964). Early contingency studies conducted during the 60s and 70s were primarily interested in the impact of the environment and technology on organizational structure (e.g. Burns 1961, Woodward 1965), which is also clearly visible in the management accounting literature. As Chenhall (2003) describe, the first studies that adopted the contingent view on accounting research focused on the importance of the environment, technology, structure and size for the design of management control systems. Subsequently, the variety of studied contextual factors has exploded, and a considerable amount of research exists describing, for instance, the roles of culture and strategy as contingent variables (see Chenhall 2003 for a literature review). Running in parallel to this literature stream focusing on management control systems, is a considerable research stream that is attempting to identify the contingency factors related to the design of management information systems (MIS). Weill and Olson (1989) have reviewed this literature and conclude that the contingency variables that have been commonly studied include strategy, structure, size, environment, technology, task (i.e., types of activities that are supported), and individual characteristics (e.g., managers personality). The authors also provide a useful representation of contingency theory, as it is commonly perceived and applied in MIS research (in Figure 10).

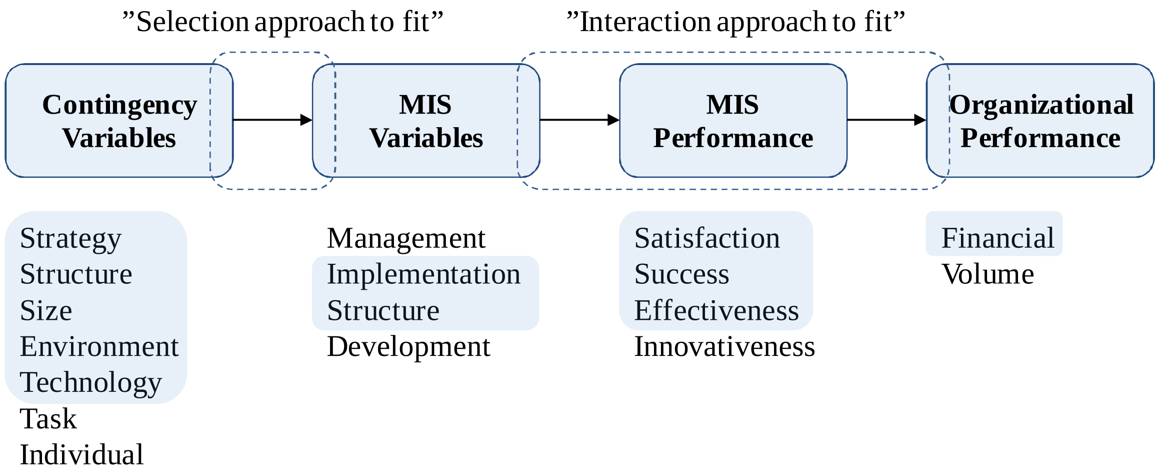


Figure 10. *Representation of contingency theory in MIS research (adapted from Weill & Olson 1989).*

The concept of "fit" has an essential role in contingency-based research. It postulates that in order to function effectively, the contextual factors and the design of the system must somehow fit together (Al-Omiri & Drury 2007). The majority of the contingency studies conducted have assumed a deterministic model of fit (illustrated by the arrows in Figure 10), whereby the causal explanation is expected to run only one way without the possibility for reciprocal relationships among the variables (Weill & Olson 1989). Moreover, the concept of fit is typically extended and assumed (at least implicitly) to also hold between the design of the system and its performance, and between the performance of the system and the performance of the organization (Weill & Olson 1989). Drazin and Van De Ven (1985) have identified alternative forms of fit, based on whether the connection to performance (of the system or the organization) is only implicitly assumed or is actually measured. In the selection approach to fit, only the relationship between the organizational context and characteristics of the system is studied, without an examination of whether this context-structure relationship actually affects the performance. However, the relationship with performance is implicitly assumed, and has often been justified on the basis of natural selection and managerial selection arguments (i.e., since the organizations and systems still exist, there needs to be a fit between these variables) (Gerdin & Greve 2004). In contrast, the interaction approach to fit is not so interested in understanding the congruence between the context and structure, but rather seeks to explicitly measure and explain the variations in organizational performance by the effect of interaction between the two. Therefore, only certain designs are expected to lead to high performance in a given organizational context, while departures from such designs are expected to diminish performance (Al-Omiri & Drury 2007). In MIS research, the performance is typically operationalized by measuring the system-related perceptions (e.g., user satisfaction, success, effectiveness, innovativeness) rather than the performance of the organization itself (Weill & Olson 1989). Chenhall (2003) draws the same conclusions regarding the literature describing the management control systems.

Despite the considerable amount of contingency studies relating to management control systems and management information systems, only a handful of papers have attempted to identify the contingency factors that explain the structure of product costing systems (Al-Omiri & Drury 2007). Although product costing systems can be regarded as a subset of management control systems and management information systems, the research evidence from these fields cannot be directly used to explain specific design choices related to these systems. For example, Chenhall and Morris (1986) provide some evidence from the relationship between environmental uncertainty and scope of accounting information, but a considerable leap of faith is required if some implications for the structural design choices of product costing systems are to be made. There are also considerable differences as to how the contingency variables (e.g., the environmental uncertainty) are conceptualized, and the controversial results of the contingency-based literature do not provide any coherent framework that could be applied to product costing systems (Chapman 1997). Despite these apparent problems of “fit” between the results of contingency-based research in management accounting systems in general and product costing systems in particular, the representation of contingency theory, as illustrated in Figure 10, is also fairly descriptive of product costing systems. Identified contingency studies that focus on product costing systems (e.g. Bjørnenak 1997, Gosselin 1997, Krumwiede 1998, Malmi 1999, Abernethy et al. 2001, Cagwin & Bouwman 2002, Drury & Tayles 2005, Al-Omiri & Drury 2007) have primarily used identical contingent variables, focused either on the implementation or the structure of the systems, and addressed the performance by perceptual measures that are related to the system, rather than the organization (highlighted in Figure 10). Moreover, the research is dominated by the selection, rather than interaction, approach to fit (Al-Omiri & Drury 2007).

The contingent view on product costing was adopted already by Cooper (Cooper 1988b), who stated that the optimal accuracy of the product costing system is dependent on the cost of measurement, cost of errors and diversity of products, which are further affected by numerous contingency factors (e.g., intensity of competition). Therefore, the adoption of the sophisticated costing system was more likely to pay off in a context where the diversity of products and the cost of errors are high and the cost of measurement is low. Following this line of thought, the early contingency research-based articles related to product costing systems adopted the selection approach to fit, and focused on the contextual factors influencing the adoption or non-adoption of ABC systems (Bjørnenak 1997, Gosselin 1997, Krumwiede 1998, Clarke et al. 1999, Malmi 1999, Hoque 2000). The most widely-studied contingency factors have been product diversity, cost structure, and size, but other variables, such as level of competition, degree of customization, quality of information technology, extent of advanced technologies/practices and competitive strategy, have also been studied. Although all the studies have found some statistically significant relationships, the results have been highly controversial and many variables have only been examined in a single study. The sole variable that has been systematically identified as having a significant positive relationship with the adoption of ABC is the size of the organization. Product diversity and cost structure (i.e., the proportion of overhead costs) have been identified as significant variables in more than one study, but this has not occurred consistently.

Given the varying results, many authors have questioned the consistency of measures used for assessing both the contingency variables and the adoption/non-adoption of the ABC system (Foster & Swenson 1997). For instance, Labro and Vanhoucke (2008), point out that the diversity in resource consumption pattern (i.e., the empirical phenomenon that measurement of the product diversity attempts to capture) "can relate to (1) differences in how resources are shared among activities and products across the whole costing system, (2) differences in proportional resource usage by activities and products at a particular cost pool, and (3) differences in the dollar size of different cost pools". Therefore, it is unlikely that any measure derived from a single question relating to product diversity (e.g., the number of products) is capable of correctly reflecting the empirical phenomenon that has been targeted. In a similar manner, the definition of adoption/non-adoption has varied considerably from one study to another. In general, adoption has been conceptualized as a genuine implementation of the system, but Krumwiede (1998) defines it as "the stage when approval has been granted to devote the necessary resources to implement ABC". Moreover, several authors have questioned whether the respondents are even capable of self-specifying their product costing system as ABC (Dugdale & Jones 1997). The same problem has also been reported in other studies that have attempted to categorically separate different costing systems that are partially based on the same core principles (Krumwiede & Suessmair 2008).

Controversial results of contingency-based research have led some authors to dismiss the dichotomous categorizations of product costing systems, and focus on the fundamental design characteristics of these systems (Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). The study by Abernethy et al. (2001) adopted the interaction approach to fit, and attempted to analyze how product diversity and cost system sophistication (measured on the basis of the number of cost pools, nature of cost pools and types of cost allocation bases) affected the perceived user satisfaction with regard to the product costing systems. The authors found that product diversity is a necessary, but not sufficient, condition to justify the investment in a sophisticated costing system. If the company uses advanced manufacturing technology to control increased product diversity, a high proportion of batch- and product-related costs are transformed into factory-sustaining costs that do not require a sophisticated costing system in order to be addressed. Therefore, managers can be satisfied with their simplistic costing system, even if product diversity is high. Drury and Tayles (2005) and Al-Omiri and Drury (2007) subsequently followed the same line of thought, but adopted the selection approach to fit. Therefore, they tried to identify specific contingency factors that are related to the use of sophisticated product costing systems. Drury and Tayles (2005) used an 8-point scale in their survey to obtain information relating to number of cost pools and different types of cost drivers, which were then aggregated into a single measure of sophistication. The authors found that product diversity, degree of customization, size and corporate sector are statistically significant contingency variables, unlike competitive environment, cost structure and importance of cost information for decision-making. Since many measures are derived from single questions and the classification of costing systems is essentially subjective (i.e., problems arise when attempting to compare two costing systems in which one has the greater number of cost pools but fewer cost drivers), Al-Omiri and Drury (2007) further attempted to improve the operationalization of different variables. They used four different proxy measures for cost system sophistication and composite scores, derived from multiple questions. Interestingly, the evidence provided by their survey is controversial, both with regard to studies focusing on the adoption of ABC and to studies attempting to more profoundly measure cost system sophistication. Al-Omiri and Dryry (2007) reported that only the importance of cost information and size were significant for all four proxy measures of cost system sophistication. Moreover, the contingency variables that were not significant for any of these four proxy measures included product diversity and cost structure, commonly held as primary indicators of the need for sophisticated costing systems.

Contingency-based accounting research has not only focused on the contingency variables that are related to the adoption of the sophisticated costing system, but has also attempted to analyze factors that influence the success of an implementation. This stream of research has been motivated by growing evidence that, despite its great prominence, many ABC systems have failed after their introduction (Malmi 1997b). Therefore, the ABC implementation projects have not always been success stories and some companies have even abandoned their renewed costing systems after their introduction. Shields (1995) has studied a broad set of possible contingency factors, and provides some empirical evidence to suggest that different behavioral and organizational variables might be more important success factors than technical implementation variables. More specifically, six implementation variables, including top management support, linkage to competitive strategies, linkage to performance evaluation and compensation, training in implementing ABC, non-accounting ownership, and adequate resources, were identified as being significantly related to ABC success. Krumwiede (1998) found further evidence to support the role of top management support in successful cost system implementation, but not for the remaining organizational and behavioral variables identified by Shields (1995). Pike (2011) subsequently found no positive correlation between top management support and success of implementation process, so there is no consensus regarding the common features of successful cost system design projects. There are naturally also a considerable number of additional studies (with many more contingency variables), but the important consideration is that the literature stream focusing on critical success factors is also haunted by inconsistent results.

Since the studies related to the success of product costing systems have not provided consistent results, Anderson (1995) proposed that the critical success factors might actually change at different stages of implementation. Krumwiede (1998) tested this hypothesis by dividing the implementation of ABC into different stages, and has provided some empirical evidence to support the claim. Although this might explain some variation in results, there are more crucial problems relating to the definition of success. Foster and Swenson (1997) pointed out that the success of ABC implementation has been defined and measured in many different ways in the existing studies. Depending on the study, success might be defined as (1) a use of ABC information in decision-making, (2) a change in decisions that are made, (3) dollar improvements resulting from ABC, or (4) a satisfaction with management. Foster and Swenson (1997) analyzed the way in which the definition of success affected the results of the studies and concluded that the models are highly sensitive to alternative measures of success. Therefore, the significant determinants of success are likely to change when the definition of success is altered. In addition to the inconsistency among the definitions of success, there are also some problems relating to the specific definitions. For example, Malmi (1997b) argues that the success of ABC should not be based on whether any further decisions are needed, but on whether the system is capable of making a correct diagnosis from the situation at hand. Consequently, some of the reported ABC failures might not actually be failures at all. More recently, researchers have begun to pay more attention to contingency factors that are related to the perceived usefulness of specific aspects of the costing systems, and not solely to the implementation of ABC systems. Pizzini (2006) reports that the managers' evaluation of the relevance and usefulness of cost data is positively correlated with the extent to which costing systems can provide greater cost detail, better classify costs according to behavior, and report cost information more frequently. In a similar manner, Schoute (2009) provides some evidence to suggest that when the costing system is primarily used for operational purposes, the intensity of use and satisfaction will increase together with complexity of costing system (defined in terms of the applied overhead absorption procedures). On the contrary, when the costing system is primarily used for strategic purposes, the intensity of use and satisfaction will decrease as the complexity of costing system increases. The apparent conclusion is that the less complex costing system might not be justifiable, not only on the basis of cost-benefit comparison, but also in absolute terms. Despite these promising results, the question of characteristics that affect the performance of costing systems under specific circumstances remains unsolved.

3. Development of research framework

3.1. Summary of the relevant literature

The fundamental cost concept in economics is marginal cost, which represents the opportunity cost of using scarce resources to produce certain products (or any other marginal change of output) instead of using the same resources for the next best alternative purpose (Bromwich 2007). The forgone profit of this next best alternative is the opportunity cost of the original choice, and therefore, the identification of opportunity costs would require the estimation of future changes in expenses and revenues. Although the concept of opportunity cost is also well-known in management accounting literature, accountants seem commonly either to ignore the alternatives that are open to the company or to assume that the alternative is idleness (Baxter & Oxenfeldt 1961). Accounting costs that are based on outlay expenses of historical cost records and the use of fixed resources are often viewed as costless in short-term decision-making. For example, material costs can usually be accurately traced to products on the basis of their historical purchase prices (i.e., they are called direct costs), but these cost figures may not represent the real sacrifice if the replacement of materials is currently more/less expensive (Baxter & Oxenfeldt 1961). This highlights the important difference between the cost concepts in economics and accounting as disciplines. In more practical terms, economic theory states that only relevant incremental/avoidable costs should be used for making pricing decisions (Drury & Tayles 1994). Although this basic concept applies both to short- and long-term decisions, most textbooks seem to adopt a short-term perspective by assuming that fixed costs remain constant regardless of the decisions that are taken. As a result, variable costs are seen to closely approximate incremental costs for short-term decisions, which justify the claims that they should be used to guide pricing decisions. If the variable costs are less than the avoidable costs, even the prices below average total costs improve the profitability of companies. The empirical evidence has nevertheless questioned the applicability of this short-term perspective and suggested that practitioners prefer using full cost information, including fixed cost allocations, as a basis for their pricing decisions (Govindarajan & Anthony 1983). This is the basic controversy between economic theory and accounting practice, which has been widely discussed in the literature.

In principle, all fixed costs that could be avoided by discontinuing the products should be accounted for when making product-related long-term decisions (Drury & Tayles 1994). Many accountants seem to believe that eventually almost all costs are caused by the products and it is possible to meaningfully assign these costs to each separate job that is carried out (Baxter & Oxenfeldt 1961). Cost accounting systems are harnessed for this purpose and are simplified economic representations of organizations that try to model how organizational resources are transformed to various outputs. Product costing systems accumulate and structure historical cost data in different units of analysis, essentially attempting to provide information that managers perceive as helpful in product-related decision-making. While economists might contest the worth of such figures on the basis that many resources are actually common to products (e.g., the same machines are used to produce multiple products), accountants believe that these systems may provide a simple, quick, and cheap method of approximating the average long-term consequences of decisions (Baxter & Oxenfeldt 1961). Cooper and Kaplan (1992) state that the purpose of the product costing system is not to estimate the consequences of individual decisions, but more likely to approximate long-term cumulative effects in the context of multiple products and interdependent decisions. During recent decades, the methods used to allocate overhead costs to products have particularly attained considerable attention in the accounting literature. This highlights the implicit belief that it is possible to improve decision-making by providing a more truthful idea of the resources required to produce various products. ABC in particular has been proposed as a tool that can help more accurately assign the costs of resources to multiple products (Cooper & Kaplan 1988a, Cooper & Kaplan 1988b). In some sense, it is believed that overhead costs are actually attributable to products only if the complex relationships between the resources and costs are first revealed. This should also be reflected in improved pricing decisions, since once the companies are capable of identifying the genuine cost implication of certain products/orders, they can be priced accordingly (Lere 2000).

Given the promise of more accurate overhead cost assignment, there has been a considerable amount of research focusing on the appropriate selection of cost pools and cost drivers (Labro & Vanhoucke 2008). Despite these studies and many practice-oriented books highlighting the need to use complex procedures to assign overhead costs to products (e.g. Kaplan & Cooper 1998), the adoption of ABC began to stagnate and eventually settled at a low level. As a result, researchers became interested in the conditions under which companies adopt so-called sophisticated costing systems (e.g. Krumwiede 1998). The costing systems that used complex methods to allocate indirect costs to products became conceptualized as sophisticated, although there was no guarantee that they better reflected the cost consequences of decisions. Since the identification of any “true” cost is unachievable in complex organizations (i.e., there are no real cost benchmarks), the empirical evidence rested heavily on findings that alternative costing systems provided different cost figures (c.f. Dopuch 1993). While early studies focused on the simplistic dichotomy between traditional costing systems and sophisticated ABC systems, subsequent studies focused more directly on the different characteristics of the costing systems (Abernethy et al. 2001). The number of cost pools and cost drivers especially were used as proxies for sophisticated product costing systems, although other features affecting the accuracy of costing systems were also considered (Drury & Tayles 2005, Al-Omiri & Drury 2007). Common to these studies was the implicit assumption that the performance of the costing system is somewhat directly linked to the alleged accuracy, which is also a view that might be easily obtained from the literature describing fundamental cost system design principles. Therefore, it was believed that by examining the relationship between cost pools/cost drivers and various contingency factors, it was possible to identify the conditions under which a certain type of product costing system worked effectively (Drury & Tayles 2005). Although the operationalization of sophistication has evolved over the years, this research stream has not provided any consistent findings regarding the appropriate cost system design under specific conditions. While some studies have identified a positive relationship between cost system sophistication and product diversity, others have not done so (Al-Omiri & Drury 2007). Overall, there remains only little knowledge as to why certain type of product costing system is perceived as being useful under specific circumstances.

Even less is known regarding the appropriate design of costing systems for specific purpose(s) of use. Although it is commonly argued that costing systems should be designed for specific managerial needs (Gunasekaran 1999), there is scant evidence as to how this should be accomplished in practice. For example, contingency-based accounting research has not attempted to identify whether the performance of the costing systems is dependent on its purpose(s) of use (except, Schoute 2009). It is still important to bear in mind that while the complex allocation of indirect costs might provide some benefits for cost control purposes, many authors actually judge these allocations of historical costs as being irrelevant from the pricing perspective (Baxter & Oxenfeldt 1961). As a result, it is at least plausible that the features of product costing systems that are perceived as useful might vary from one purpose of use to another. If this is true, the performance of product costing systems cannot be addressed without referring to the manner in which they are actually used in organizations. It is also notable that the use of cost information in pricing is commonly viewed as a synonym for the application of cost-based pricing rules, and the "irrelevancy" of cost allocations is based on the assumption that the cost information is used to directly determine prices (Shipley & Jobber 2001). Nevertheless, the empirical evidence shows that cost figures are rarely directly used to make pricing decisions without at least considering other important factors (e.g., competitors and markets), which hints that cost information may also play other roles in decision-making (Skinner 1970). Burchell et al. (1980) identified some of these alternative roles, but they have rarely been incorporated into the discussion around the use of cost information to support pricing decisions. If the cost information is used, for instance, to stimulate a certain kind of pricing behavior in organizations, the allocation of overhead costs through a certain kind of allocation structure may fairly well be justifiable. There are also many other important cost system design choices (e.g., timeliness, level of detail, scope) that ultimately have an impact on whether the costing system is perceived as useful under specific circumstances. The important question is to what extent these characteristics vary from one purpose of use to another, and what implications this has for contingency-based accounting research and the practical efforts of building costing systems to support various managerial tasks.

3.2. On building theories and frameworks

The fundamental nature of theories and theory building (i.e., theorizing) has been commonly discussed in various textbooks and academic journals. Despite the huge amount of theorizing about theories, there seems to be little agreement with regard to what constitutes a theory or an adequate theoretical contribution in management accounting (e.g. Llewelyn 2003, Malmi & Granlund 2009) or social sciences in general (e.g. Bacharach 1989, Whetten 1989, DiMaggio 1995, Sutton & Staw 1995). While some researchers appear to conceptualize theory as any idea that can serve as a basis for testable hypotheses, others place very stringent conditions on what counts as theory. Sutton and Staw (1995), point out that there actually appears to be a much broader consensus of what theory is not. Bacharach (1989) argues that data, typologies and metaphors cannot be considered as theories. In a similar manner, Sutton and Staw (1995) point out that references, lists of variables/constructs or diagrams cannot constitute theories by themselves. The common denominator for all of these is that they, by themselves, represent merely descriptions of objects and events rather than explanations of them. Although many authors also stress the importance of providing descriptive narratives around organizational life during the early stage of research, the researchers still appear to agree that the core of scientific theories lies in explanations and predictions (Sutton & Staw 1995). Alternative forms of descriptions (i.e., references, diagrams, variables, constructs, data, typologies, and metaphors) may describe the empirical patterns that are observed, but a theory is required to explain why they emerge or are expected to emerge (Bacharach 1989). This is not to undermine the role of various descriptions in the process of constructing theories, but rather to illustrate the necessary "creative leap" from data to theory (Weick 1995). As Mintzberg (1979) vividly pointed out, "The data do not generate theory – only researchers do that…".

Sutherland (1975) defines theory as "an ordered set of assertions about a generic behavior or structure assumed to hold throughout a significantly broad range of specific instances". Although this definition captures many essential features of a "good" theory, it simultaneously narrows the scope of theories in explaining regularities instead of, for example, observed variance (DiMaggio 1995). Whetten (1989) approaches the essence of complete theory from a broader perspective by attempting to identify the different elements from which a good theory is made. The first essential element is that the theory must contain only the "right" factors (variables, constructs, concepts) that are needed for a logical explanation (Whetten 1989). Therefore, theories should not include factors that are inessential or exclude factors that are essential, for the explanation of the phenomenon of interest (Bacharach 1989). The second element is concerned with the relationships between the identified factors, commonly illustrated by the arrows connecting the boxes (Whetten 1989). By using the terminology provided by Bacharach (1989), the constructs (i.e., abstract concepts that are not directly observable) are related to each other by propositions, while the variables (i.e., specific factors that are directly observable) are connected by hypotheses. Together these variables and their relationships constitute the domain or subject of the theory.

In principle, the first two elements of a theory would already enable the formulation and testing of hypotheses. However, in order to avoid being merely descriptive, a rationale for the selection of the specific variables and relationships is required. Therefore, the third element of complete theory includes the explicit statement of reasons why certain objects and events are expected to be relevant (Whetten 1989). These reasons constitute the basis for the explanation of the phenomenon, simultaneously enabling the generation of predictions. The role of predictions is important, since they provide the means to "falsify" the theory by comparing empirical observations against the predictions (Popper 1962). Although the importance and existence of the falsification mechanism is still discussed, it is nevertheless agreed that theories should not be stated in such vague terms that they are forever exempt from empirical refutation (Popper 1962, Bacharach 1989). This partially relates to the final element of complete theory, which includes the explicit statement of limitations that restrict the applicability of the theory to specific instances (Whetten 1989). Bacharach (1989) divides these limitations into the implicit values of a researcher and the more explicit restrictions regarding time and space. While spatial boundaries restrict the theory to specific units of analysis (e.g., types of organizations), temporal boundaries specify the historical applicability of the theory. Together these assumptions determine the generalizability of the theory, which is commonly seen as an essential virtue. However, the paradox of theorizing is that no theory can simultaneously be general, simple and accurate, meaning that more general theories are necessarily stated in more abstract and unspecific manners (Weick 1979). Therefore, all the researchers must make trade-offs between these virtues of a good or complete theory. On the basis of Bacharach (1989) and Whetten (1989), the different elements of the theory are depicted in Figure 11.

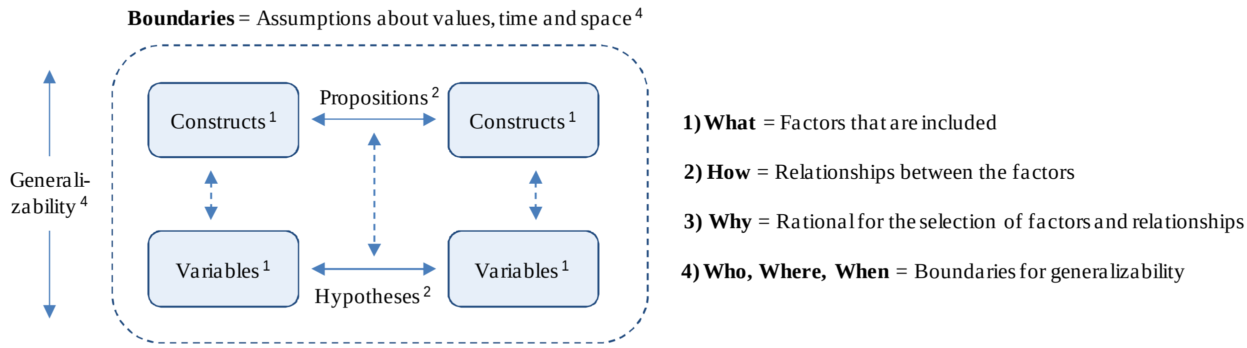


Figure 11. *The elements of a complete theory (adapted from Bacharach 1989).*

It is acknowledged that the presented view on the theory is rather traditional (i.e., positivistic), but it also remains common in management accounting. For example, Llewelyn (2003) states that accounting scholars still largely view theories as representing an observed reality and to explain regularities between the empirical phenomena. Malmi and Granlund (2009) make the same observation and call for more practice-oriented theories that are helpful in explaining what systems to use, how and in which circumstances. They argue that management accounting is an applied science, where theory and data are always interdependent, and the ultimate purpose of understanding the underlying causes and effects is the improvement of management accounting practices. Given this often implicit rationale for conducting research in this field, it can be argued that normative theories (which are not always regarded as theories by the academic community) are not actually very different from what is traditionally understood by the theory (Malmi & Granlund 2009). For example, ABC could be labeled as a theory of cost accounting, essentially trying to explain how overhead costs should be assigned in order to provide the best possible decision support. Since it specifies the constructs, their alleged relationships, the underlying logic of expected improvements, and some limitations to applicability, it seems to fulfill the criteria set out for a theory. It may not be a theory of cost accounting in the sense that it could predict accounting practices, but it may predict organizational performance. In conclusion, Malmi and Granlund (2009) call for greater recognition of normative theories of management accounting that instruct on the organization of accounting and control practices under specific circumstances.

Similarly, as ABC can be seen either as a theory or a tool, there also appears to be disagreement as to whether models, frameworks, and theories can be distinguished from one another. Whetten (1989) makes no distinction between frameworks and theories, and Crossan et al. (1999) describes the elements of good framework directly through the requirements placed on theories. It remains more usual to discuss models or frameworks instead of theories, probably because the word “theory” is still primarily reserved for grand theories (Weick 1995). In this dissertation, a conceptual framework for cost system design is constructed. In principle, it could also be labeled as a theory, but the term framework is used to highlight the abstract nature of connections and the early stage of theorizing. The following chapters attempt to identify the relevant factors, propose some relationships between them, describe the underlying logic of the selections, and state some restrictions of the framework. This is done by adopting the pragmatic approach to theories and their purpose in the field of management accounting (c.f. Malmi & Granlund 2009). As Gorry and Scott Morton (1971) argues: “Without a framework to guide management and systems planners, the system tends to serve the strongest manager or react to the greatest crisis. As a result, systems activities too often move from crisis to crisis, following no clear path and receiving only ex post facto justification."

3.3. Development of a conceptual framework

3.3.1. Making sense of ambiguous terminology

The construction of a framework should begin with the specification of constructs and variables. This requires making sense of current use of terminology around the phenomenon of interest. In this dissertation, the focus is on the effective design of a costing system, which is currently discussed through rather ambiguous terminology in the literature. In essence, all the studies that have addressed the issue of how to design costing systems to fit specific circumstances have discussed the elemental design choices through unspecific terms, such as "sophistication", "complexity" and "functionality" (e.g. Abernethy et al. 2001, Drury & Tayles 2005, Pizzini 2006, Al-Omiri & Drury 2007, Brierley 2008, Schoute 2009, Brierley 2010). The use of the term "cost system sophistication" has been especially diverse, which might convey a somewhat erroneous image of the essential cost system design choices. Initially, Abernethy et al. (2001) and Al-Omiri and Drury (2007) related sophistication to the specific methods used to allocate indirect costs to products, therefore clearly focusing solely on the structural design and alleged accuracy of the product costing systems. Drury and Tayles (2005) further argued that sophistication should probably also include other aspects of cost system design, and used the term "complexity" instead of sophistication to describe essentially the same structural characteristics of costing systems (Brierley 2008 actually hints that the complexity was used because one of the reviewers preferred it). The authors also pointed out that complexity is more value-free, since the pursued level of complexity is clearly context-dependent, while sophistication might be perceived worth pursuing as such. Moreover, Drury and Tayles (2005) explicitly relaxed the alleged relationships between complexity/sophistication and accuracy by pointing out that, on some occasions, simplistic cost accounting systems are also capable of reporting accurate product costs (e.g., when the share of overhead costs is low). The fundamental point was still, that on some occasions, only sophisticated costing systems are capable of reporting accurate product costs.

Pizzini (2006) adopted a more conceptual approach to cost system design, and used the term "functionality" to describe its critical attributes. While the earlier use of cost system sophistication and complexity were strictly related to the structural characteristics of the system itself (i.e., how costs are processed in the system), the concept of functionality instead related design choices to the essential characteristics of the information that is used (input) or produced (output) by the system. Therefore, Pizzini (2006) was more interested in characteristics of cost information that are perceived as being relevant and useful by managers. The results showed that the perceived usefulness was related to the level of detail and possibilities of classifying cost information according to behavior, simultaneously suggesting that accuracy is unlikely the only criterion that is placed on the provision of cost information. Further, Brierley (2008) acknowledged that the usefulness of the cost accounting system should be analyzed from the user perspective (instead of the system perspective focusing on structural choices), but concluded only that sophistication can take multiple forms that should essentially be separated from one another. More recently, authors interested in cost system design choices appear to have adopted either the sophistication/complexity or functionality approach, and the ambiguity of terminology is still very much present. Among recent articles discussing cost system design choices, Pavlatos and Paggios (2009) used functionality, Schoute (2009) used complexity, and Brierley (2010) used sophistication, to discuss more or less the same issues. However, Brierley (2010) used the term "overhead assignment sophistication" to stress that the overall sophistication must be conceptualized more broadly than only in terms of indirect cost allocations.

On the basis of this discussion around terminology, it seems reasonable to conclude that the researchers are slowly moving toward using complexity to describe the technical structure of costing systems. Therefore, sophistication of costing system is conceptualized as something broader, which also includes aspects related to the possibilities of using cost information for various purposes. For example, the practitioners interviewed by Brierley (2010) distinguished between the sophistication concerned with the calculation of product costs and the sophistication concerned with the use of product costs. The decision to use complexity to describe "the sophistication concerned with the calculation of product costs" seems somewhat appropriate, but the complexity should not be reserved for describing only the methods used to allocate indirect costs to products. At least the methods used to handle direct costs should be included, since some companies might use highly complex systems to directly trace costs to cost objects (Brierley 2008). This same notion also highlights the problems related to the use of sophistication to describe the elegancy of indirect cost allocation methods (as originally used by Abernethy et al. 2001). While sophistication is generally perceived as something worth pursuing, this would actually suggest that companies should aim for cost allocations instead of avoiding them. However, since cost allocations are a more inaccurate method of assigning costs than direct tracing, this would clearly be contrary to the conventional wisdom of cost accounting (Geiger 1999b). Therefore, it seems more plausible that the sophisticated costing system is one that does not need to resort to cost allocations. However, sophistication cannot be solely determined on the basis of the methods used in cost assignment, and what appears to be missing from the original conceptualization is "the sophistication concerned with the use of product costs". This is actually quite close to the characteristics discussed by Pizzini (2006) under costing system functionality. While complexity might somewhat reflect the system's potential to provide accurate cost information, functionality better captures the features related to usability. Therefore, sophistication, as conceptualized by practitioners (Brierley 2008), is actually close to what is attained if the characteristics related to complexity and functionality are combined. This stance is illustrated in Figure 12.

Figure 12. *The relationship between complexity, functionality, and sophistication.*

If cost system sophistication as a term is used to describe fundamental cost system design choices affecting the performance of costing system, it should somehow reflect the combined effect of structural elegancy (i.e., complexity) and practical relevancy (i.e., functionality). A sophisticated costing system should not only be capable of producing accurate cost information, but also information that is relevant from the user perspective. Although the combination of complexity and functionality is close to the way in which sophistication is understood in this dissertation, the problem is that this combination still does not form any coherent framework for further analysis. If sophistication is understood almost as a synonym for value, the complexity of indirect cost assignment cannot ultimately be the target of the cost system design process (i.e., the complexity per se is unlikely to increase the value). Conversely, the attributes associated with functionality (Pizzini 2006) are not likely to capture all the characteristics that make cost information perceived as valuable. However, since complexity is actually used only as a surrogate for the alleged accuracy (i.e., a specific feature of information), it can be questioned whether sophistication could be conceptualized solely on the basis of the characteristics of the cost information that is provided. By following this line of thought, the sophisticated product costing system could be understood as one that produces high-quality information. While this might first appear to be a far-fetched idea, it is actually rather close to that of Chenhall and Morris (1986) who analyzed the design of MAS through several broad information characteristics (i.e., scope, timeliness, integration, and level of aggregation). Tillema {{5314 Tillema, Sandra 2005/a;}} subsequently directly referred to these characteristics when discussing the sophistication of MAS. Therefore, it also appears possible to understand the sophistication of product costing system more directly through general information characteristics.

3.3.2. Sophistication as a capacity to provide high quality information

If sophistication of costing system is understood through general information characteristics, the framework provided by Chenhall and Morris (1986) seems like a natural starting point. However, this framework appears to lack some of the key characteristics commonly associated with useful product costing systems (e.g., accuracy) while simultaneously including some characteristics (e.g., integration) that are not easily understood as natural characteristics of information. Therefore, it might be useful to search for a more general representation of information quality from outside of the management accounting discipline. Since the quality of information provided by any information system is a highly researched area, there is no lack of frameworks for use in assessing information quality. Both the academics and practitioners have conducted an excessive amount of work to identify a coherent set of criteria (IQ attributes) that are placed on information quality, but so far there seems to be no consensus of what attributes are essentially important. Quite the contrary, almost all the papers discussing the issue appear to provide their own conceptualization of the requirements placed on information quality. DeLone and McLean (1992) identifies 18 different frameworks, published between 1974 and 1987, which present a certain attribute set to evaluate information quality. By combining the attributes that are proposed in various frameworks, the authors represent their own set of criteria, which altogether include 23 IQ attributes. While some of the proposed attributes are directly connected to the content of the information (e.g., accuracy and precision), the remainder were instead linked to the use of information (e.g., interpretability). Therefore, the framework appears intuitively capture the dichotomy of requirements (i.e., structural elegancy and practical relevancy) placed on the sophisticated costing systems. However, DeLone and McLean (1992) do not classify their set of attributes further, which hinders the possibilities of their use in understanding the nature of sophistication.

Goodhue (1995) views information systems (i.e., technology) as a mean by which individuals perform their tasks. He argues that “the success” of information systems can be assessed through the task-technology fit, which is the extent to which functionality of the system matches the task requirements and individual abilities. The approach is rather similar to that adopted by Pizzini (2006), but Goodhue (1995) follows the idea further by dividing the decision-making process into separate stages that must be supported by the information system. In order to make decisions, the user of the information system must first identify and acquire the required data before integrating and interpreting it as part of the decision-making process. Goodhue (1995) organizes different IQ attributes under these three categories, simultaneously suggesting that the task performance of the individual is not only related to the intrinsic nature of information, but also to how it is represented and how it can be accessed. Shortly afterwards, Wang and Strong (1996) explicitly divided the elements of information quality into the following subgroups: intrinsic, contextual, representational, and accessibility. Although this division does not incorporate the processional perspective of Goodhue (1995), it has received much attention in the literature. This is likely because it has helped to establish some order among the endless sets of different IQ attributes. It is notable that Wang and Strong (1996) actually discuss data quality, rather than information quality, but the terms are seen as synonyms in this case (furthermore, the authors later changed their terminology to use information quality instead). The proposed framework is depicted in Figure 13.

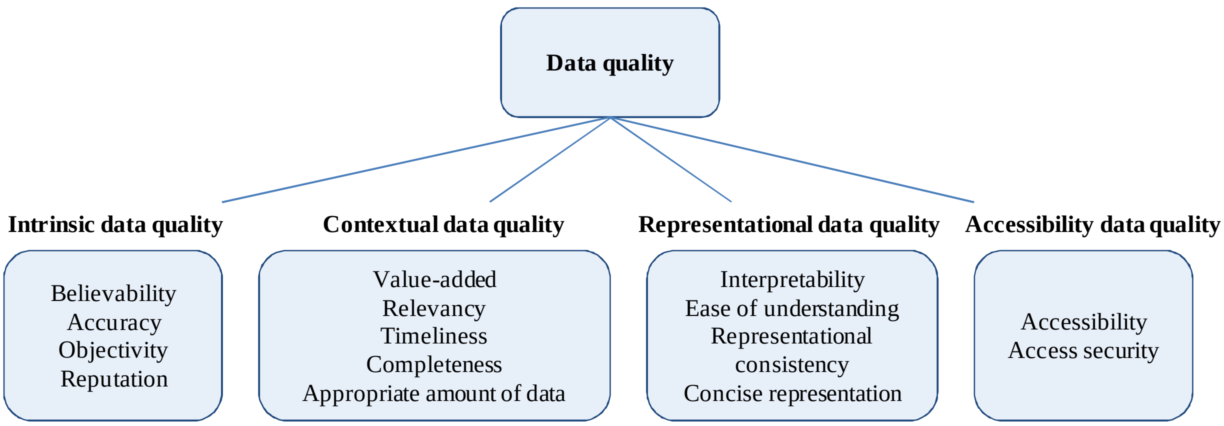


Figure 13. *Attributes of information quality (adapted from Wang & Strong 1996).*

Intrinsic data quality implies that the information has quality of itself, and is further divided into believability, accuracy, objectivity and reputation (Wang & Strong 1996). Gorry and Scott Morton (Gorry & Scott Morton 1971) argues that this view is commonly overemphasized in the design of information systems, especially when the users of the information system are not involved in the development process. This might also be visible in the normative literature of cost system design, whereby the structural design choices aiming at accuracy are by far the most discussed area of interest. However, just as quality cannot be determined independently of the consumer, neither can information quality be understood as independent of the context in which it is used (Strong et al. 1997). The contextual information quality implies that intrinsically flawless information might not be useful if it is incomplete, outdated or aggregated to an unsuitable level (Wang & Strong 1996). Although it has often been assumed that decision-making can be enhanced by simply providing more detailed and accurate information, it might also be the case that too much information already exists at too detailed a level (Ackoff 1967). Therefore, managers might already be overwhelmed by a huge amount of irrelevant information without having the tools to filter from it the relevant information. This is partly related to the representational information quality, which includes the attributes that affect the possibilities of integrating and interpreting the information correctly as part of the decision-making process (Wang & Strong 1996). If the information system provides relevant information, but the decision-maker is unable to understand the nature of it, the system starts to work like a “black box” and is unlikely to have the correct impact on the decisions. Finally, the accessibility information quality implies that the information must be reachable in a safe manner, independent of the time and place (Wang & Strong 1996).

Since Wang and Strong (1996) published their criteria set for information quality, there have been many other categorizations of different IQ attributes (see Knight & Burn 2005 for a literature review). These frameworks suggest both additional attributes to the existing categories and formulate new categorizations of their own. For the purposes of this dissertation, the representation of Wang and Strong (1996) is selected, since the purpose is not to define exactly the specific characteristics as to why information is perceived as valuable. It is still notable that the specific attributes presented in the framework appear intuitively quite close to what could be expected from the information provided by the sophisticated costing system. It is nevertheless even more important that the framework better provides the means to understand the components of sophistication at the subcategory level. It can be argued that the original definition of sophistication attempted to capture the essence of intrinsic information quality. Although there is no inevitable link between the accuracy and number/nature of cost pools/cost drivers, all the papers discussing the topic have at least implicitly referred to this alleged relationship (e.g. Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). Similarly, it can be seen that the features discussed by Pizzini (2006) and Chenhall and Morris (1986) were primarily related to the category of contextual information quality. For example, scope, timeliness, level of detail, and aggregation are clearly only to be judged in regard to a specific decision-making context and not in isolation. Although different cost classifications (e.g., variable versus fixed) can be understood as part of the representational information quality, the last two subcategories are not currently incorporated into the discussion around the sophistication of costing system. Both categories are nevertheless somewhat discussed in the more general literature describing costing systems (for example Cardinaels 2008 discuss the importance of presentation format). Furthermore, the practitioners interviewed by Brierley (2008) related sophistication to the understandability of cost information. Therefore, they appear to be important aspects of cost system design, and should be incorporated as part of the sophistication. On the basis of this discussion, cost system sophistication is here understood to be the system’s ability to provide high-quality cost information. A sophisticated product costing system should provide intrinsically correct information that fits the intended purpose of use and is represented in a manner that is easily understood.

3.3.3. Conceptual framework for cost system design

The current discussion around the cost system design choices highlights the technical structure of indirect cost allocations and the majority of the provided frameworks focus on the design choices of the cost pools and cost drivers from the accuracy perspective. Since there remain many other design choices and information characteristics, this might convey an overly simplistic view of the issues related to cost system design. Brierley (2008), for example, suspects that the importance of indirect cost allocations is overemphasized, simply because the researchers have not paid attention to any other important aspects. More conceptual models (e.g. Mevellec 2009) partially avoid these problems, but simultaneously provide no guidance to actual design choices concerning the structure of the system. As a consequence, the various models of cost system design (e.g. Gunasekaran 1999) together with the discussion around sophistication/functionality (e.g. Drury & Tayles 2005) may not provide an adequate starting point for the cost system design task; i.e., they may not correctly reflect the factors that affect the performance of costing systems. First, the discussion is commonly begun directly from the structural design choices, without paying much attention to the analysis of decision-making context and the intended use of the system. Second, the frameworks commonly aim to provide accurate cost information without explicitly depicting the necessary trade-offs with other requirements that are placed on the cost information. Third, the discussion seems partly to mix the characteristics of the information (e.g., accuracy and timeliness) and the specific design choices (e.g., number of cost pools and cost classifications) through which these characteristics are provided. Therefore, some kind of integrative framework, which combines the aspects related to the structural and conceptual design choices together with their likely effects on the information characteristics that are perceived valuable in a specific context, might have some potential in advancing the discussion around cost system design.

The conceptualization of cost system sophistication through general information characteristics provides some benefits over the more traditional models of cost system design. Most significantly, it clearly distinguishes the information characteristics that are perceived as valuable by the users, from the cost system design choices through which these characteristics are provided. By making this distinction, a stronger emphasis is placed on the contextual analysis as a starting point for every cost system design. By beginning the cost system design task from the analysis of the decision-making context, it should be possible to derive the requirements that are placed on the cost information (Gorry & Scott Morton 1971). Moreover, by analyzing how different requirements are affected by various cost system design choices, a better fit between the contextual factors and design choices should be achieved. Therefore, the use of information characteristics as a linkage between the contextual factors and cost system design choices might help to improve understanding of these aspects of cost system design are related to one another. It simultaneously provides a more complete depiction of multiple viewpoints that must be balanced. For example, there is likely a fairly strong inverse relationship between the accuracy and interpretability/ease of understanding, since the addition of cost pools and cost drivers is likely to increase the accuracy, but decrease the understandability. In a similar manner, a modest inverse relationship between accuracy and timeliness can be expected, because the complex costing systems need more time to calculate, analyze and prepare the cost information (Pizzini 2006). Since the relative costs and benefits associated with these characteristics and their provision are likely to vary depending on the contextual factors, this kind of analysis might also help decision-makers to better judge whether the additional investments in certain structural design choices are justified, given the perceived benefits. Figure 14 provides a schematic illustration of use of the general information characteristics as a linkage between the contextual factors and the cost system design choices.

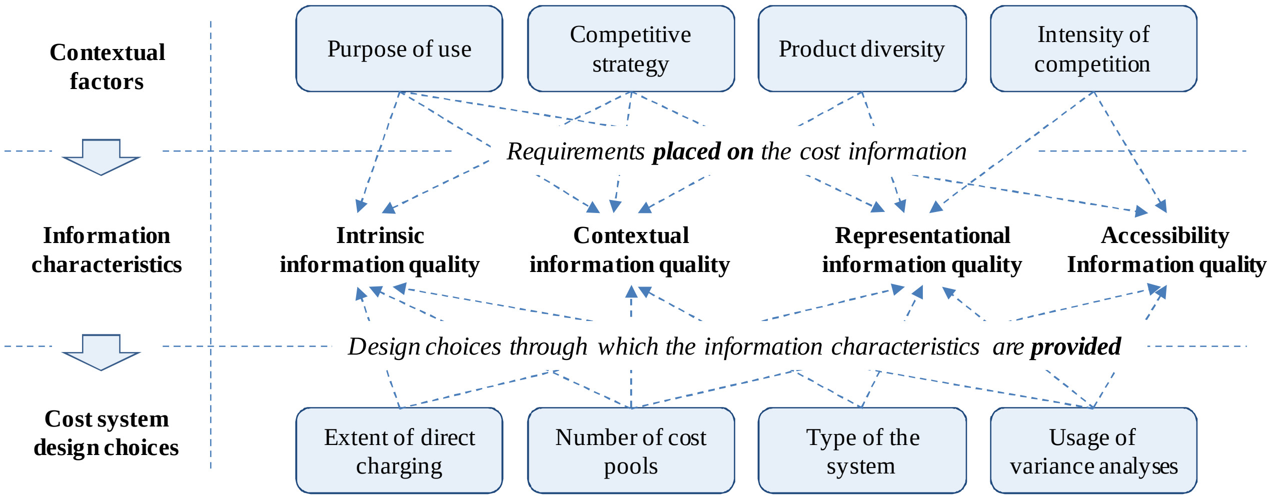


Figure 14. *The role of information characteristics in linking the context and design choices.*

The cost system design choices have so far been discussed from the user perspective, which is also the dominant approach in the literature. It remains to be acknowledged that costing systems shape organizations on a much larger scale and the appropriateness of design choices cannot be assessed based solely on the quality of information that is provided. Zeist and Hendriks (1996) divide the participants of software development projects into users, maintainers and operators, and developers. While the users might be interested in the content of the information itself, maintainers and developers might be more focused on the maintainability and portability (transferability) of the system. In a similar manner, managers at the higher organizational level may perceive the value of the system from a broader perspective than its direct users. While individual users analyze the costing system through its ability to support them in decision-making, managers may perceive these systems as control devices that are used to motivate and restrict certain kinds of behavior in the organization (e.g. Simons 1991, Simons 1994, Simons 1995). Therefore, costing systems can be actively used to steer the organization, and there might even be some instances in which purposeful distortions in cost information are beneficial in order to achieve desired organizational goals (Merchant & Shields 1993). Even if costing systems are not purposefully used to shape the organizations in specific manner, they never simply stand as mirrors reflecting the objective truth of organizational life (e.g. Burchell et al. 1980, Roberts & Scapens 1985, Hopwood 1987, Macintosh & Scapens 1990). Costing systems are always socially constructed by themselves, and shape the image of what is perceived as valuable, what are the legitimate activities, and what are the power relationships between individuals and departments (Macintosh & Scapens 1990). In order to understand the broader role of costing systems in organizations, the requirements placed on the system itself, together with the likely behavioral consequences, must be analyzed as part of the cost system design task.

The recognition of multiple perspectives highlights some further benefits that are attained by conceptualizing the sophistication of costing system through general information characteristics. Since the different stakeholder of the cost system design project come from various functions and backgrounds, the communication of requirements directly through design choices is problematic (i.e., the users of cost information are not necessarily accountants). The use of information characteristics provides a means to communicate through the terminology that is somewhat similarly understood by all the members of a design team. For example, the marketing manager is more likely to state a view regarding required accuracy, rather than the required number of cost pools or cost drivers. Despite this obvious benefit, the multiplicity of perspectives simultaneously causes some problems for the concept of cost system sophistication. If both the multiplicity of perspectives and the sophistication as "perceived value" are accepted, there is likely to also be multiple perspectives on the sophistication (i.e., the role through which individuals contemplate the costing system affects the perception of sophistication). Following the Garvin's (Garvin 1984) ideas regarding the different viewpoints of quality, the sophistication of costing systems can be assessed from the manufacturing-based, the user-based and the holistic viewpoints. While the user-based view would highlight the content of the information provided, the manufacturing-based viewpoint (i.e., the viewpoint likely taken by the developers of the system) would more likely focus on the systemic characteristics and the conformance with the specifications. The holistic viewpoint recognizes these different perspectives and would suggest that the sophisticated costing system must correctly weight the various requirements. Although non-biased balancing of different perspectives is unattainable in practice, it should still be a natural starting point for the cost system design task. Therefore, it is also partially adopted in this dissertation, although the user perspective is emphasized over the other viewpoints. On the basis of this discussion, a conceptual framework for the cost system design is proposed in Figure 15.

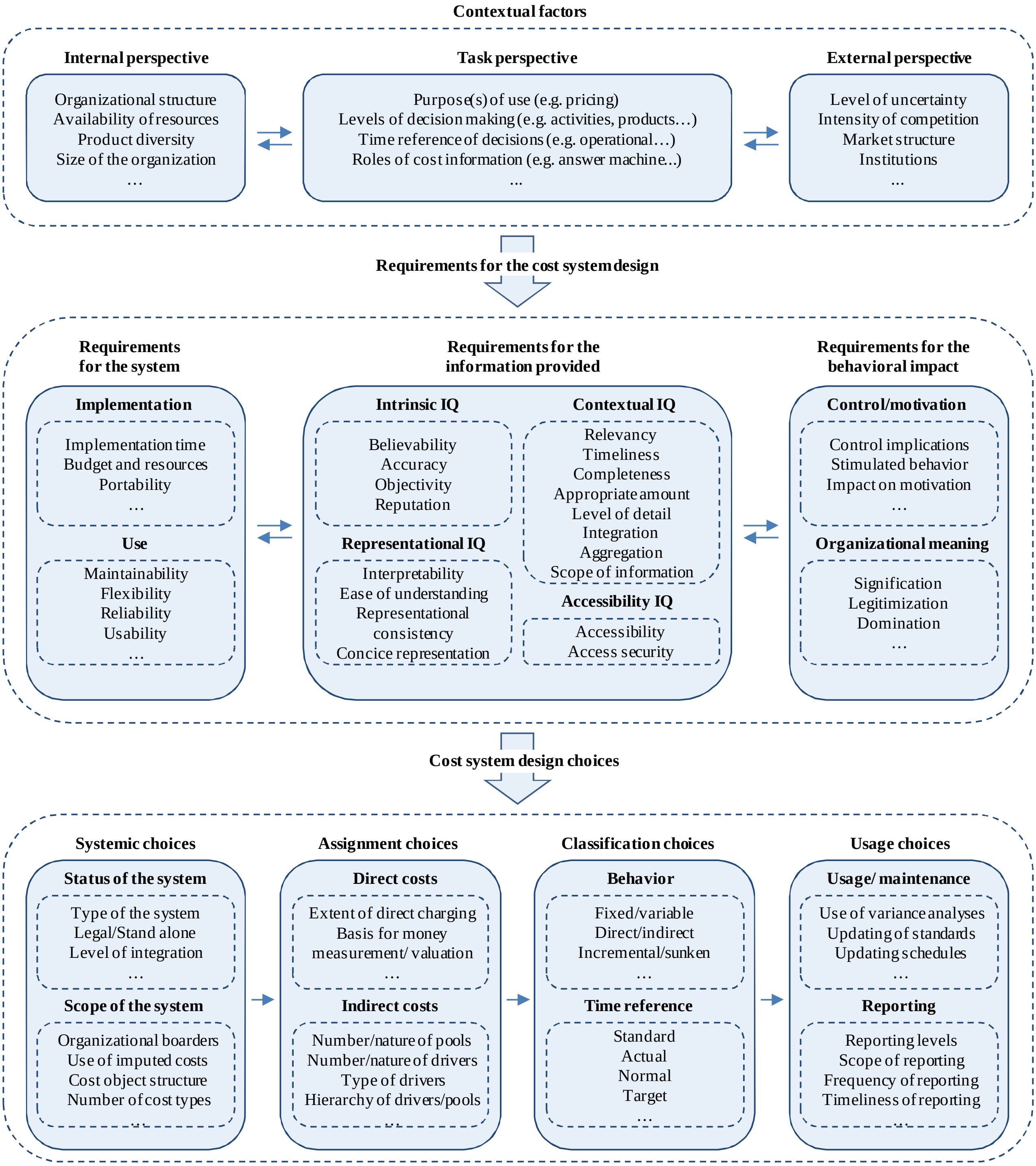


Figure 15. *A conceptual framework for the cost system design task.*

The preliminary stance taken in this dissertation is that cost system design choices and sophistication are currently approached from too narrow a perspective. Therefore, a broader conceptualization of the problem is proposed, together with a conceptual framework to guide the cost system design task. With regard to the content of the framework, there are several important remarks to be made. First, the classification of factors in all three different levels is partly arbitrary and other choices could also have been made. However, the objective was not to provide a perfect depiction of different factors (there are many more of them) and their relationships, but rather to illustrate alternative perspectives through which the cost system design problem can be approached. For example, the contextual factors could have been classified (e.g., technical, organizational, behavioral) and labeled (e.g., organizational, environmental) in many alternative ways, and the current selection was made simply to emphasize the role of task-level contingencies (Tillema 2005), which are further examined in this dissertation. Second, the information quality framework adopted from Wang and Strong (1996) is modified to include the contextual attributes discussed by Pizzini (2006) and Chenhall and Morris (1986). Since these characteristics have been specifically discussed in the cost accounting literature, they are expected to supplement the original framework in this context. However, the intent is not to propose any complete set of attributes. Third, the requirements placed on the cost information differ from the requirements placed on the system in the sense that they are clearly cost-object dependent. Therefore, it might not be realistic to suppose that any single level of "optimal" accuracy can be found. Fourth, the arrows in the framework illustrate the need to balance different perspectives or the general sequence of various decisions. The aim is not to propose any clear causal relationships, but rather the expected natural order of events or decisions. It might be reasonable, for instance, to choose the type of the system before making any final decisions concerning the structure of cost allocations. Fifth, the framework is organized in stepwise manner, but it is acknowledged that the process of cost system design is an iterative one. Sixth, although the framework might seem to suggest that the requirements stemming from the contextual factors are directly reflected in the cost system design choices, the question is ultimately whether the benefits obtained from the particular costing system will exceed the associated costs.

In conclusion, certain comments regarding the purpose and elements of this framework must be made. First, the framework is not meant to be descriptive in the sense that it would accurately describe the cost system design process in any organization. As Mintzberg (1979) pointed out, "All theories are false, because all abstract from data and simplify the world they purport to describe. Our choice, then, is not between true and false theories so much as between more and less useful theories." Here, the choice is clearly made in favor of "useful theory" instead of "true theory" in the positivistic sense. Therefore, the framework clearly falls into the category of normative theories; attempting to provide some guidelines as to how cost accounting systems can be designed to fit for specific circumstances (Malmi & Granlund 2009). However, that being, it cannot be understood as a theory of cost accounting, but rather as a theory of organizational performance, in that it attempts to explain how and why cost accounting systems can be constructed to support organizational performance. It is nevertheless not currently labeled as a theory, since the selection of constructs is somewhat arbitrary and the connections between them are highly abstract and vague. The framework simply organizes different concepts into a coherent form that hopefully provides some means of assessing the cost system design problem from different perspectives. Moreover, the limitations of the framework are not discussed her, since they are rather findings and conclusions of the empirical part of this dissertation. As Weick (1995) pointed out, theories rarely emerge in their complete form, but they take the form of diagrams, references, data and lists of variables in the early stages. Therefore, the framework might currently resemble more diagram than theory, but it still can be a theory in the making.

3.4. Research setting for the case analysis

The discussion of cost system sophistication primarily takes place in the context of the contingency-based research stream that has attempted to identify important determinants that are related to the adoption or success of so-called sophisticated costing systems (e.g. Bjørnenak 1997, Krumwiede 1998, Malmi 1999, Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). As already stated, these studies have primarily adopted the selection approach to fit, focusing exclusively on the relationship between the organizational context and characteristics of the costing system (e.g. Bjørnenak 1997, Krumwiede 1998, Malmi 1999, Drury & Tayles 2005). Therefore, the contextual factors have represented the independent variables that are manipulated in order to observe their influence on the characteristics of the costing systems (i.e., the dependent variable). Earlier studies have used the adoption of ABC as a dependent variable (e.g. Bjørnenak 1997, Krumwiede 1998), while more recent studies have replaced this by some measure of cost system sophistication (e.g. Drury & Tayles 2005, Al-Omiri & Drury 2007). Since sophistication is not directly observable (i.e., it is a construct, not a variable), it must be operationalized into variables that can be measured by using survey questions (Bacharach 1989). The commonly used proxy measures for sophistication include number/nature of cost pools and cost drivers, which are assumed to be related to the contextual factors under examination (Drury & Tayles 2005, Al-Omiri & Drury 2007). Despite these improvements in the conceptualization and operationalization of sophistication, the results of this contingency-based research stream remain highly inconclusive and somewhat controversial (e.g., different variables are identified as statistically significant, the significance levels are low, a low proportion of variance is explained by the models, etc.). On the basis of this evidence, it seems that "…the factors influencing the design of product costing systems are poorly understood" (Drury & Tayles 2005), and there is a clear need to more profoundly understand fundamental cost system design choices and their relation to performance of these systems.

The selection approach to fit is primarily interested in the congruence between the contextual factors and the system characteristics, without explicitly paying much attention to effects on organizational performance (Drazin & Van de Ven 1985). It remains important to notice that the positive relationship to performance is still implicitly assumed (Weill & Olson 1989). If the study shows a significant positive relationship between the number of cost pools and the share of indirect costs, it is assumed that the increasing number of cost pools provides some benefits in a context where the share of indirect costs is high (i.e., a system with higher number of cost pools is more effective under these conditions). This linkage to performance is also essential from the hypotheses development perspective. Although, in principle, it would be possible to develop testable hypotheses without any kind of ex-ante justification for the selections, there would remain a need to explain identified relationships by making inferences regarding the performance of the system. Identified statistical relationships between certain variables cannot make a theory or theoretical contribution by themselves, but a reasonable explanation for the observed phenomenon is required (Whetten 1989). For example, Al-Omiri and Drury (2007) justify the expected relationship between intensity of competition and cost system sophistication by arguing that inaccurate product cost figures would lead to more severe negative consequences under intensive competition (i.e., competitors would be more likely to take advantage of wrong decisions caused by even small errors). Therefore, the stated hypothesis regarding the relationship between the contextual factor (i.e., intensity of competition) and the characteristics of the system (i.e., cost pools and cost drivers that increase the accuracy of cost information) is justified by the likely effect on organizational performance.

Although a more interpretative research approach to cost system sophistication and design choices is adopted here, it is beneficial to use the terminology of the existing contingency-based literature to position the aim of this dissertation. With regard to this literature, the conceptual work that is conducted around cost system design principles and sophistication examines the assumed fit (i.e., a leap of faith) between structure and performance of the cost system. Therefore, it is theoretically examined as to whether the performance of the product cost system can be meaningfully explained by simply referring to the alleged accuracy of the cost information that is provided. If the performance of the product costing system is not actually directly linked to the number/nature of cost pools and cost drivers, then the understanding regarding the importance of the different cost system design choices might be somewhat limited. This would mean that the basis for theoretical hypotheses development might lie on shaky ground, and the practical efforts of cost system design might be overly focused on the provision of accurate product cost information at the expense of other important requirements. The hope is that by better understanding the relationships and mechanisms between cost system design choices and the performance of the system, it is possible to generate more theoretically grounded hypotheses regarding the expected relationships between the contingency factors and the specific structural characteristics of the system. Moreover, it should be possible to design costing systems that better reflect the requirements stemming from the specific circumstances. In Figure 16, this stance and the motivation of answering the first research question is positioned toward the common framework of contingency-based research in MIS (as depicted by Weill & Olson 1989).

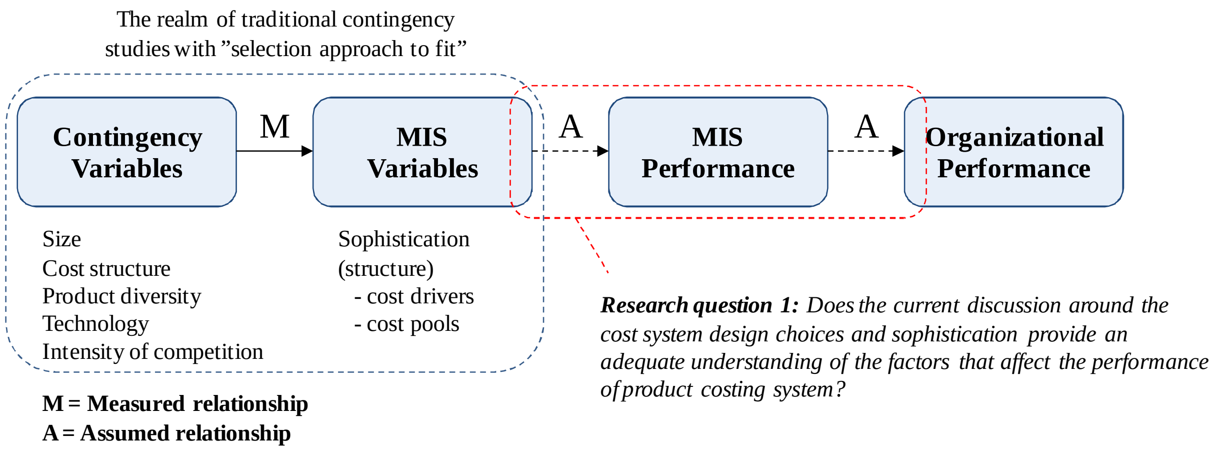


Figure 16. *Research question 1 and the contingency theory in MIS research.*

Given the theoretical understanding of the potential relationships between the contingency variables, characteristics of the costing system and performance, the empirical part of the dissertation aims to examine these relationships further. In some sense, the empirical work attempts to put some flesh on the bones of the developed framework by analyzing the established costing system in its light. The aim is not to validate the framework us such, but rather to support the more theoretical claim that broader conceptualization of cost system design problem is required in order to gain a more profound understanding of the relationships between cost system design choices and performance of the costing system. The interaction approach to fit is adopted using the terminology of Drazin and Van de Ven (1985); that is, the performance of the costing system represents the dependent variable that is explained by the interaction effect of the cost system characteristics and the organizational context. In practice, the way in which specific design choices under specific circumstances affected the performance of the system was examined. Although some earlier contingency studies have also adopted this view, there have been considerable difficulties in measuring the performance of the system through the survey elements (Foster & Swenson 1997). The problem is partially avoided here by using the case study approach wherein the performance of the costing system can be directly observed. The relationship between the performance of the system and the performance of the organization is still somewhat unobservable, and has to be assumed.

Since both case companies claimed to design product costing systems explicitly in order to support pricing function, the opportunity is used to examine the role of specific purpose(s) of use (i.e., pricing) as a contextual factor in cost system design. Chenhall and Morris (1986) encouraged researchers to concentrate on the importance of different information characteristics in regard to specific types of managerial work, such as pricing, which is basically what is attempted here. Although it is commonly claimed that costing systems should be designed to support specific managerial needs, the purpose(s) of use has not been incorporated into to the existing contingency-based studies either as an independent variable or as a parameter that is fixed in the sample (e.g. Drury & Tayles 2005, Al-Omiri & Drury 2007). Therefore, it might become what Meredith (1998) calls an "unrecognized independent variable", which is potentially partly the cause of the inconsistent findings and low significance levels of the existing contingency studies. If the purpose(s) of use is genuinely an important factor in explaining the performance of costing system, it might give rise to such a variability in the results that no significant relationships can be found between the identified variables (Meredith 1998). By a more profound understanding of the requirements that pricing as a managerial task sets to cost information and costing systems, it should be possible to better understand how the purpose(s) of use might shape the actual design of these systems. The two case studies that are analyzed in this dissertation represent somewhat polar types, when it comes to pricing as a managerial task. This should make it possible to draw some preliminary conclusions regarding both the general requirements that pricing as an accounting task sets for cost information (i.e., to what extent are the cases similar, despite their nature as polar types?) and specific requirements that are bound to other contingency factors (i.e., to what extent are the cases different, despite having pricing as a common denominator?). These findings should enable the discussion as to whether the purpose(s) of use is truly an important contingency variable, and the implications that this has for contingency-based accounting research and the practical efforts of building effective costing systems. In Figure 17, the second research question and the research setting for the empirical part of the dissertation are positioned in relation to the common framework of contingency-based research in MIS.

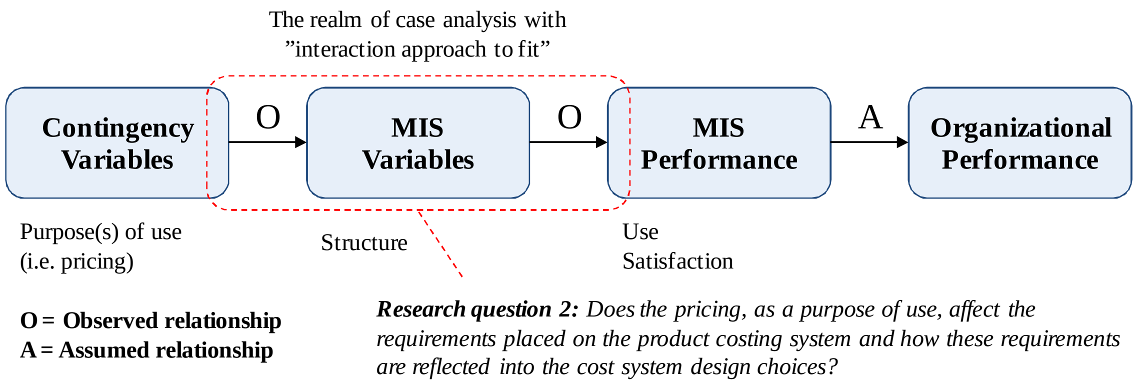


Figure 17. *Research question 2 and the contingency theory in MIS research.*

In order to make sense of the empirical part of this dissertation, it might be beneficial to briefly sum up the above discussion at this point. In plain language, the case studies are used to identify the cost system design choices that affected the perceived performance of the established costing system. This is used to put flesh on the bones of the first research question and the claim that a more profound conceptualization of cost system design and sophistication is required. If the dissertation is to be successful in this aim, it has to show that the performance of costing system is not directly linked to design choices regarding the number/nature of cost pools and cost drivers (or even accuracy in more general terms). The observations regarding the performance of the system are made in the context in which both case companies claimed that they redesign their costing systems in order to better support pricing, which is used to examine the role of purpose(s) of use as a contingent variable in cost system design. The aim is to explore whether the requirements placed on the product costing system are actually shaped by the intended use of the system, and the way in which this is eventually observable from the design choices that are made. If the purpose(s) of use really is a meaningful contingent variable, it has to be shown that the cost system design choices were affected by the intention to use the system to specifically support pricing. In this sense, the context of pricing can be viewed as a single exploratory case study regarding the more general argument that costing systems should be designed, at least to some extent, for specific purpose(s) of use. The normative nature of this last claim reveals the overall motivation for answering these two research questions, which is the enhanced understanding of the processes of designing the costing systems to support managerial decision-making and control. If the contingent nature of the relationships between the organizational context, the cost system design choices and the performance of the system are profoundly understood, it should be possible to design better cost accounting systems.

4. FinnBakery: a domestic industrial bakery

4.1. Overview of the case company and its operational environment

FinnBakery is a family-owned, mid-sized Finnish company dating back almost 100 years, and it remains under the ownership of the original founding family. The company operates in the bakery and café industries, which are divided into separate affiliated companies. These subsidiaries are controlled and steered by a parent company, which is responsible for the overall decision-making and drafting of extensive operational strategies for the subsidiaries. In total, the companies employ around 200 employees, and the annual turnover has been approximately €20 million during the last 5 years. The analysis presented in this dissertation is primarily based on work that was conducted in cooperation with the bakery division (including the influence of the parent company), which generates around three quarters of the total net sales and employs around 140 people. Although the figures regarding the bakery division might sound rather small on a global scale, FinnBakery is nevertheless the third or fourth biggest bakery in Finland behind the two dominant (much bigger) market leaders. This shows that the bakery industry in Finland is rather scattered and is characterized by a few nationwide industrial bakeries, a small amount of regional bakeries and a high number of local bakeries. This is illustrated in Table 7, which is based on statistics from the Central Statistical Office of Finland (2010).

Table 7. *Structure of the bakery industry in Finland (adapted from Hyrylä 2011).*

Number of employees	Number of companies	Turnover	Number of companies
Unknown	10	Unknown	34
0-4	488	0,0 - 0,2 M€	386
5-9	92	0,2 - 0,4 M€	103
10-19	68	0,4 - 1,0 M€	99
20-49	40	1,0 - 2,0 M€	49
50-99	10	2,0 - 10,0 M€	32
100-249	8	10,0 - 20,0 M€	13
1000-	2	20,0 - M€	2
Total	**718**		**718**

Bakery products are repeatedly purchased consumer goods with stable demand and consumption patterns. During the last 10 years, the overall market size has annually increased by around 2% in monetary terms, but the total sales volume actually started to decrease in 2009 (Hyrylä 2011). This modest development has resulted in considerable overcapacity in the industry, which has been demonstrated by the low prices and the constant closings down of small bakeries. The market is dominated by a few big industrial bakeries that have over 80% of its total (Hyrylä 2011). Similarly, as the bakery industry is dominated by few big players, the bakery products market is also highly concentrated. Although the end customer base (i.e., the consumers) is highly diverse in many ways, the direct customer for many bakeries is a retail chain or a wholesaler. The market share of the three biggest retail chains in Finland is around 88%, and the fourth biggest player also has over 5% of the total market (Hyrylä 2011). Since these retail chains have centralized their purchasing functions, they typically have considerable negotiation power, compared to small Finnish grocery producers. In this sense, the market for bakery products can be described as oligopsony (Bhaskar et al. 2002), which is a market form characterized by a small number of buyers, but a potentially large number of sellers.

FinnBakery (the position illustrated in Table 7 by a thin red line) can be counted as one of the few industrial bakeries in Finland, since its production is operated through five automated production lines. Although these production lines are primarily designed for mass production purposes, the scattered product mix, with many low volume products, does not enable genuine mass production, but rather a batch production with varying batch sizes. The product mix consists of around 60 main products, which generate around 200 different stock-keeping units when different brands (including own brands, contract-manufacturing brands and private labels) and package sizes are included. This product mix is highly diverse in terms of volumes and batch-sizes, since some products are delivered nationwide and have a market share of up to 80% (within the product category), while other products are only delivered regionally and have less than a 1% total market share. Therefore, FinnBakery can be described as a mixture of a nationwide and regional bakery, in that it tries to preserve the positive image of a regional player while simultaneously pursuing the volumes of a nationwide player. The company strategy is to focus on the product categories where it is the clear market leader (not only winning a greater market share, but also expanding the market itself), while simultaneously maintaining the current position in several other important product categories in order to retain high capacity utilization in production lines. Although the strategy has proven rather successful, the profitability of the bakery division has remained unsatisfactory since 2007.

Regarding pricing, the bakery industry possesses some important characteristics that set the context for the decision-making. Product unit prices are relatively low, and different companies provide their customers with quite similar varieties of product. In this sense, bakeries operate in a “commodity business” that is comparable to other repeatedly purchased packaged goods. As a result, differentiation has become quite difficult for the industry and many producers use price as an important competitive weapon (Hyrylä 2011). This is not only because of price-sensitive end customers, but also because of the big retail chains that are willing to promote only the products that are profitable from their perspective (high contribution margins, fast circulation times, etc.). Therefore, the low price for a retail chain is sometimes seen as a means to achieve visibility in the market, which it is hoped will be subsequently paid off through higher volumes and lower unit costs. Conversely, differentiation through prices is also challenging, since the end-user market is characterized by rather constant “market prices” and product margins are extremely low. Therefore, managers might perceive themselves as price-takers and easily turn their efforts to volumes and costs, the other two components of profitability. There are nevertheless considerable differences when it comes to contracts with the retail chains. The invoice prices might be quite close to each other, but the industry is characterized by a significant amount of different bonuses, promotions, and incentives that contribute to the final transaction prices (Marn & Rosiello 1992).Therefore, each contract has its own terms when it comes to order size discounts, payment terms discounts, annual volume bonuses and co-op advertising, which makes the comparison of actual prices fairly demanding. These different reimbursable off-price components might typically constitute anything up to 20% of the gross price.

Many characteristics of repeatedly purchased consumer goods highlight the strategy of immediately setting a justified everyday price in the new product-pricing situation. This price can be slightly modified from one customer to another, or in certain promotions, but radical price changes are hard to implement after product launch. This is primarily due to the high negotiation power of the three large retail chains that dominate the Finnish retail market. Moreover, it would take at least 4 to 12 months to actually change the price, since prices are commonly agreed for a time period of at least 4 months each time. In practice, the life cycle of many bakery products (especially those that are unsuccessful) is shorter than the time period needed to change their prices. Changing the price image in consumers' minds is also very difficult, so price reductions of previously overpriced products are likely to be unsuccessful. Many past cases from the company's history have taught that once a product's sales start to decline, it is extremely hard to stop the slide by making price changes. Therefore, alternative pricing strategies, such as skimming and penetration (Dean 1950) are rarely used in the industry. Further, the more general earning logic tends to be rather straightforward, while other revenue streams, such as complementary products, additional services, spare parts or maintenance, rarely exist to any significant extent. As a consequence, the long-term real price strategy, whereby the price of a new product is immediately set to its long-term target, is often pursued (see Shipley & Jobber 2001 for an illustration of the long-term real price strategy). Under these circumstances, it is important to be capable of estimating product costs in advance of actual production. Only a minority of new product innovations will be successful in the long-term, and there is significant development costs related to new products, so the economic potential of products should be analyzed during the development process. Given the low margins, products might not be even capable of recovering the initial costs related to product development, production start-up (e.g., test drives and investments), marketing, and purchasing of molds and package materials.

4.2. Description of product costing practices and the use of cost information in pricing

When pricing was originally discussed in FinnBakery, people intuitively appeared to relate it to the setting of a single everyday price for a new product that is launched. This highlights the mental dominance of new-product pricing, although other pricing decisions are also commonly encountered in the company. These include, for instance, biannual price changes of existing products and pricing of one-off special orders for single customers (e.g., a single order from export markets). Since the new product-pricing decisions must be made in advance of actual production, they are heavily intertwined with the product development process and must deal with the ex-ante product cost information. The product development and pricing process usually starts with a tentative product concept with a recognized market potential, which is communicated to product development. Product development is responsible for turning this concept into an actual product within the frames (i.e., specified requirements) that are primarily provided by the sales and marketing personnel. The production department then determines the capacity of the production line, set-up times, production schedules, waste percentages and other central production variables on the basis of product specifications (e.g., ingredients, package materials, physical appearance, baking time, etc.) and some preliminary test runs. It is also responsible for estimating the unit costs of production by transforming the production variables into monetary consequences by using the internally agreed calculation rules. The estimated unit cost of production is then further communicated in the sales and marketing, which completes the full-cost estimates by adding the delivery, sales/marketing, and administration costs into the calculations. The obtained cost-based “price” is then compared to similar products in the market, and final adjustments are made on the basis of the competitive situation. Therefore, the final pricing responsibility rests primarily on the shoulders of sales manager and the role of product development and production is to serve as mechanistic “cost calculators”. The reality is naturally a little more complicated, but the standard pricing process can nevertheless be illustrated by a rather linear flow chart, as depicted in Figure 18.

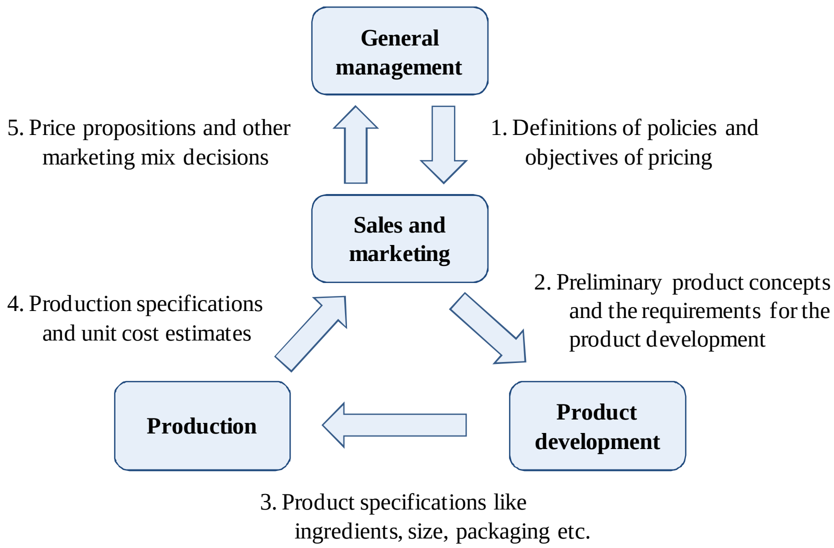


Figure 18. *General steps in a new product development and pricing process.*

Other major pricing decisions (i.e., price changes, pricing of one-off orders) also follow the same basic principles, beginning with full-cost estimates and ending with judgmental balancing of cost-based prices and market factors. The only real difference is that the unit cost figures, based on the actual production, together with the realized sales figures, are now available to support the decision-making. In addition to the decisions where actual prices (i.e., the numbers) are set for products, the decisions regarding pursued pricing strategies, policies, tactics, and contract terms with customers can also be viewed as key pricing decisions. The objectives of pricing may vary from one product category to another, which further affects the pursued pricing strategies and tactics. With some product categories, profitability is pursued by attempts to expand the overall markets and retain the market share, while other products (e.g., private labels) are simply used to retain high capacity utilization in production lines. These decisions are commonly made by placing greater emphasis on other factors than cost information (e.g., market share, capacity situation, etc.), but customer profitability analyses are used when the contract terms are negotiated with customers. Moreover, there are also many closely related decisions concerning the products (e.g., whether a certain product should be dropped from the catalog) and customers/sales regions (e.g., whether to use joint delivery together with a competitor), which are commonly discussed as part of the pricing problems in the company. For example, the dropout decisions commonly follow the pricing situations in which no economically feasible solution for the price-volume problem can be found.

The description of the typical pricing process conveys the idea that product costing and cost information plays a fairly important role in the pricing process. This was also confirmed by the sales manager, who constantly referred to the low margins of products and the importance of accurate product cost information in pricing. However, the product costing practices that are used to produce this cost information are highly simplistic. FinnBakery operates product costing through the enterprise resource planning system (ERP), which was clearly designed around production management (e.g., recipes, production schedules, etc.) rather than product costing purposes. The functionality of this standard costing system is built around the bill-of-materials (known as recipes in the bakery industry) and bill-of-operations (routings), which should describe the materials and operations (i.e., the direct costs of production) that are required to produce the product. While the recipes are generally up-to-date and correct, already because of the strict traceability requirements that are set for materials, the routings include only labor that is required in the production line. Moreover, the unit costs are calculated by dividing the average labor cost of a worker (e.g., €24/hour) by the effective capacity of the production line (e.g., 1000 units/hour), meaning that costs are accumulated by the system only when the production lines actually produce something. However, the production lines rarely function at full capacity and the share of different stoppages (e.g., coffee and lunch breaks, set-ups, breakdowns, test runs, etc.) might be almost equal to actual production time. As a result, the standard costs generate only about half of the actual labor costs of production and the difference is simply called "assisting work" and is allocated on top of the assigned costs. Therefore, it is assumed that all products incur these stoppages and costs in equal proportions. In reality, the share that set-up time takes of total production time may vary from 5 to at least 50%, depending on the product. Therefore, low-volume products are probably subsidized by high-volume products, which can be produced more efficiently. On top of the direct material and labor costs, the company adds the estimated waste as a percentage, and this typically varies from 5 to 10%. The result is then once more multiplied by a constant factor, which is derived by comparison of standard and actual costs from previous years (i.e., standards are not updated on the basis of variances).

When it comes to practices used to allocate indirect manufacturing costs to products, the same procedures of percentage-based add-ons on top of the already assigned costs is used. The indirect manufacturing costs (i.e., energy, supervision of work, quality assurance, maintenance, etc.) are simply pooled together and allocated to products on the basis of the total sum of material and labor costs. Therefore, there is only one overhead cost pool and related cost driver, so the formal cost accounting system produces unit cost estimates that are primarily affected by the direct material costs, the capacity of the production line, the amount of labor needed in that line, and the firm's overall cost structure. The direct material and labor costs in particular have a severe impact on the final unit cost figures, since most of the remaining costs are allocated as percentages on top of these. The costs that are incurred outside the production department are not formally allocated to products, but to customers (i.e., the individual retailers) who are seen to "cause" these costs. The sales and marketing costs related to cooperative advertising, payment terms discounts, and annual sales bonuses are directly traced to customers, since they are typically determined as percentages of total sales already in the customer contracts. Therefore, they are automatically deducted from the total sales figures. All the remaining administration overheads (consisting primarily of costs related to delivery, sales and marketing and administration) are allocated to individual customers on the basis of their share of total sales. In principle, if administration costs are 10% of total sales, each customer is assumed to share this same cost structure. In practice, there might some variations in the allocation rates, and the retail customers are burdened with different delivery cost rates from the wholesale customers. However, the allocation process means that almost all the customers have a similar “burden rate” and the customer profitability figures primarily reflect the mix of products that each customer buys (and not the consumption of resources they truly cause). For pricing purposes, the administration overheads are also occasionally allocated to products on the basis of the same allocation principles. For example, if the share of delivery costs is, on average, 15% of total sales in the retail channel, the same average is used to estimate the delivery costs of the new product in that same channel. Therefore, it is assumed that each product uses existing delivery routes in similar proportions and incurs costs in relation to the total sales. One curious consequence is that if the price of the product is decreased, the allocations of delivery, sales and marketing, and administration costs also behave as if they are affected by the decision.

Although product cost information was widely used to support pricing decisions in FinnBakery, no-one appeared to be satisfied with the current state of product costing. The sales manager complained that product cost estimates were commonly produced only after the pricing decisions are already made and the accuracy of cost information was poor. The problem was not so much that the pricing decisions based on existing information were somehow substantially “wrong” in any meaningful sense, but there had been many cases in which the entire product launch should have been cancelled or postponed on the basis of the analysis of the product’s economic potential. Conversely, the product development manager felt that there was insufficient enough information and tools to estimate product costs, since the entire development process was often in its early phase when the information was required. There might be a preliminary understanding of the product concept and central development choices, but the impact that these choices had on production (i.e., set-up times, capacities, production schedules, waste percentages, labor required, etc.) remain blurred. It is simply not very beneficial to state that some development choices increased the required set-up time from 30 minutes to 45 minutes, if the meaning of these figures cannot be understood outside the production department. Since the existing product costing system and related practices used only a few variables as input information, many of the key decisions that were made cannot even be analyzed by these simple calculation rules (e.g., set-up times are not considered). Without any experience of the more elaborate product costing practices, the production managers simply did not know how the more subtle determinants should be accounted for in product cost estimates. They also complained that the sales department was incapable of producing any meaningful sales volume estimates, which are perceived as essential if product costs are to be analyzed.

There were also some other problems that were related to the use of cost information in pricing decisions. The existing system lacked the dynamism that would be required in order to respond the emerging pricing opportunities. Even after product launch, when realized costs and volumes would be accessible, the same standard cost figures were provided to support the decision-making. These figures, at best, represented the historical situation, but they did not provide much help when considering the marketing mix decisions that may affect the future. Since the majority of the costs were allocated by simple volume-related drivers, it was simply impossible for the sales manager to reason the way in which different decisions might affect cost structures. Therefore, the sales and marketing department attached great value to a product costing system that would help them to analyze the way in which different decisions affected product costs and profitability. The generated cost information was also rather useless when it came to other key pricing decisions. This was partly related to the poor accuracy of the information, but was also linked to the cost objects that were used. In principle, the system was only capable of analyzing the average cost of product units and the total costs of individual customers. However, the profitability figures of single retailers were rather useless in reality, since almost no decisions can be made at this level of analysis; all the pricing decisions were made with the retail chains and concerned at least some specific geographical area in its entirety. Therefore, it would have been of greater importance to analyze whether the "profits" from a small amount of relatively big retailers can offset the "losses" from small retailers within the same retail chain, than to constantly point out the poor profitability figures related to some small retailers. The cost and profitability figures were nevertheless not provided at this level of analysis, although they could be derived by combining the individual retailers into more meaningful units of analysis. In a similar manner, there were many decisions that concerned only single orders from specific customers, certain promotions, product families or product groups. Since cost information was not routinely generated at these levels of analysis, the decisions were made on the basis of other information sources.

4.3. Process of cost system redesign

The problems with product costing and pricing practices described, acted as a trigger for the cost system redesign project that was launched at the beginning of 2007. At the early phase of the project, it was agreed that the product costing system would be primarily used to support pricing. In fact, many people seemed almost to regard product costing and pricing as synonymous, and no other potential purposes of use were considered or even recognized. Since the company possessed no expertise concerning the principles of cost system design, the researchers were invited to participate in the redesign process. The core project team was established around two researchers, two production managers, the sales manager, the product development manager, the chief financial officer, and the chief executive officer (CEO), but naturally dozens of other people also collaborated during the 2-year project. It was agreed that the redesign process would begin with an analysis of current practices (which have been described in previous chapters) and then continue with the modeling of key processes and activities, which would then guide the actual redesign process. Although the type of costing system can be an essential cost system design choice, it was clear from the beginning that it was not possible to tailor the existing ERP system to better support the product costing purposes. The small organization simply had no resources to modify the current ERP system, so a MS Excel/MS Access-based system was to be developed. The plan was first learn from the actual requirements that are placed on the cost information by developing a stand-alone costing system, and then possibly move toward the integrated solution on the next occasion that the entire ERP system was renovated.

Since it was agreed that the costing system would be redesigned primarily for pricing purposes, the sales manager should probably have had a major role in the determination of system requirements. However, he was not very keen to participate, and instead only constantly stressed the importance of accurate product cost information in an environment where the profit margins are extremely thin. Moreover, all the problems with the existing practices seemed to lie elsewhere, and the distortions in production costs were especially constantly raised. In one highly descriptive conversation, the sales manager explained that the distortions in production costs are critical since they tend to "be repeated" when the sales and marketing department multiply the production costs by two. Although this statement, which reflects the importance of cost based pricing rules and the average 50-50 share of production costs and administration overheads, might be somewhat exaggerated, it conveys the stance taken towards the source of the problems. If only more accurate estimates regarding the production costs could be made, a corresponding improvement in pricing decisions would occur instantly, although also the means to use this information in pricing could have been questioned. While the response from the sales and marketing department was somewhat subdued, both production managers were enthusiastic about the project and were immediately willing to cooperate with the researchers. One driving force was that they regarded it as an opportunity to promote their own conception of an appropriate production strategy, which concentrated on producing fewer products with larger batch-sizes. While the production department was primarily held responsible for the efficiency of production, the high number of low-volume products clearly contradicted their objectives. As the production manager once explained, the sales and marketing departments appeared to regard all the products as "important to overall business", although it was evident (at least to the production managers) that they were losing money. However, without any concrete numbers to support these claims, the complaints were inefficient and had not led to any changes.

The project began by the modeling of various production processes, partly because of the greater initial support from the production managers. These processes were initially broken down into smaller activities and their cost drivers were analyzed. Although direct costs were commonly seen as a rather unproblematic area of product costing, almost the first 6 months were used solely to more accurately assign direct labor costs (i.e., understood as shop floor labor costs) to products. This involved the establishment of processes through which the actual production volumes, waste percentages, and production times (including the effects of various breaks) could be accurately measured and used to calculate the unit cost figures that better reflected the impact of various set-up times and batch-sizes. Moreover, the activities that were not directly linked to the running of production lines were modeled by using the principles of activity-based costing. For example, the costs related to dough-batch making were pooled together and allocated to products by using the number of dough-batches as a transaction driver. Although it would have been possible to directly trace these costs to products (i.e., to measure the resource usage of different dough-batches), it was perceived as more convenient to use the cost allocation. By these allegedly more accurate costing methods, the amount of so-called assisting work (i.e., the amount of direct labor costs of production that cannot be assigned to products based on causal relationship) was gradually reduced from 100% to around 20%. The remaining assisting work was viewed as being caused by multiple small production tasks and general inertia that could not be traced to individual products. As a result, it was allocated to products based on the already-assigned labor costs. The share of "assisting work" also became as an important measure of production efficiency, since it basically described the success of production planning and control.

It was only through these first calculations regarding the direct costs of production when the sales manager showed any real interest toward the product costing practices. Since the preliminary results showed that some low-volume products were extremely costly to produce, the sales manager first objected that such cost assignments could not be made. The curious thing is that the objectivity or accuracy of assignments were not questioned, but it was simply claimed that some products could not be sold (because of high price) if the assignment rules were to be accepted. The pricing rules and routines were so deeply rooted in the company that the sales manager actually even appeared willing to make purposeful distortions to the cost information in order to get the price “right”. This stirred some interesting ideological discussions related to the relationship between product costing and pricing. It was finally agreed that the product costing should aim at producing a truthful image of product costs and that it was not necessary to retain any specific pricing rules linking the costs and prices together; the purpose of product costing is to inform pricing decisions, not to make them. Another interesting ideological discussion was related to the valuation of direct labor, which is a highly important issue in the bakery industry, where the collective labor agreement is obliged to pay +100% extra for the night shift. If these costs are simply traced to products that are actually baked during the night, they all appear to be unprofitable, given the equal allocation of the remaining costs. However, they might not really “cause” these costs, since the selection is primarily based on the amount of labor that is required (although on some occasions freshness requirements also affect the selection). Therefore, the products that are less labor-intensive are commonly produced at night. Conversely, by using the average cost of a labor hour as a valuation principle, none of the results would reflect the actual consequences of producing or dropping the products from the selection. In fact, if the marginal costing principles were followed, all the labor costs should be valued on the basis of the expensive night shifts. Even if the products that are currently baked in the daytime are dropped, it is the expensive night hours that are actually reduced. It was finally agreed that the direct labor was valued based on the average cost of labor hour, but there should be an option to flexibly change the valuation principle.

Once an agreement regarding the principles used to calculate the direct material and labor costs of production had been reached, the allocation of indirect manufacturing costs became relevant. These costs are primarily related to the energy consumption of production lines, supervision of work, maintenance of machines and facilities, and warehousing. Initially, the single existing cost pool was divided into multiple cost pools separately representing, for instance, the warehousing and supervision of work. Second, the costs were allocated to products on the basis of direct material costs (e.g., costs of raw-material storage) or direct labor costs (e.g., costs of work supervision). The majority of the manufacturing overheads were nevertheless not directly allocated to products; they were instead first traced (or allocated) to different production lines. For example, the energy costs were first traced to production lines by installing gas and electricity meters to measure the actual energy consumption of different production lines. In a similar manner, the maintenance activities were registered by production lines and were used to allocate the costs of the maintenance cost pool to the production lines. Although these costs were indirect in relation to products, they were actually primarily direct with regard to production lines. Therefore, the production lines became highly important cost objects in the costing system and it was possible to establish the average cost of operating the production lines by dividing the direct costs of these lines by the total number of hours that they were operated. These costs could be then further allocated to products on the basis of their usage of production lines. Finally, the costs of waste produced during the process (the number of products produced less the number of products delivered) were tracked and allocated to products that were actually sold to customers. The waste was valued by total production costs, since they also consumed materials, labor and production lines in the same way as all the remaining units.

After the first year of the cost system redesign project, it was now possible to produce full-cost figures that allegedly better reflected the resource consumption of products. Moreover, it was possible to analyze how different variables affected these figures, which further increased the communication between the sales manager and the rest of the project team. When new products were introduced, the sales manager began to produce different scenarios regarding the sales volumes and prices, which were analyzed by the researchers and production managers. Through these early scenario analyses, the sales manager began to slowly understand how the production costs actually behaved and also became interested in the distortions in customer specific costs. Therefore, the scope of the project was slowly expanded outside the manufacturing costs, and the dispatching, delivery and sales/marketing costs were especially analyzed. The first step was to trace the costs to the cost objects for which they were direct rather than forcing some allocations to products. The delivery costs were first gathered into separate cost pools representing each delivery route, and then further assigned to customers on the basis of multiple cost drivers that varied based on the invoicing model used in each delivery route (e.g., number of customers, order size, distance). In a similar manner, the sales and marketing and administration costs were allocated to retailers and retail chains on the basis of their characteristics (e.g., the size class of the retailer). While this was perceived as fair when it came to customer profitability analysis, it was burdensome to use this kind of cost information for pricing purposes, which were mainly concerned with products as a whole. Therefore, the delivery costs were eventually also allocated to products by using the number of pallets delivered as a cost driver. It was reasoned that the average cost of delivering a single standard pallet in any delivery route would be a sufficiently accurate measure to estimate the total cost of delivering any number of product units. Ultimately, even sales/marketing and administration costs were allocated to products; however, these were treated rather as business sustaining costs, and the allocations were only suggestive.

When the sales manager had become thoroughly involved in the project, the demand for various scenario analyses increased rapidly. Since the production processes of products are quite similar, it was justified to estimate the cost implications of new products by using the historical activity cost rates and approximating demand for them. For example, if the average cost of dough-batch making had been 10€/dough batch in the past, it was also assumed to hold true in the future. Therefore, the only input information required to estimate the dough-making costs of new products (at the unit level), was the amount of units that were produced from a single dough-batch. Naturally this requires an assumption that all costs are variable, but it this was perceived as fair in the instance of long-term new product pricing decisions. However, it was time-consuming to produce these analyses, since the system was not designed to support them. In order to overcome these problems, the practices were standardized into a separate system designated a “pricing tool”. The basic idea of this tool was to use average activity cost rates from the past 6 months and provide an easy-to-use user interface for the simulation of various pricing scenarios. The tool included sections for each essential stakeholder (i.e., sales/marketing, production, product development) together with corresponding information requirements (i.e., sales volume, price, material cost, package size, capacity, set-up time, etc.). Moreover, it linked these variables to the cost allocation rules so that analysis of the way in which different design choices affected the cost structure of products was flexible. In practice, the user was required to enter the sales volume estimate, capacity of production line, set-up time and number of produced batches, and the system automatically calculated the estimated need for a production line (sales volume/effective capacity + set-up time * number of batches) and allocated the costs accordingly. Moreover, if the set-up time or production schedule was changed, the cost estimates were instantly updated.

With the assistance of the newly developed pricing tool, the sales manager began to play “pricing games”, whereby the cost implications of various pricing-related decisions were actively analyzed. The decisions that the sales manager was especially keen to analyze included volumes and prices, delivery channels and models, production schedules (e.g., one/two batches per day) and the effects of different allowances. While the scenarios became more complicated, the scope of the pricing tool was also gradually widened to include delivery, sales and administration costs. Since all the cost implications could not be modeled by the standard mathematical equations (e.g., sales volume and waste percentage were linked together in nonlinear manner, and had to be judged by the production managers), the interaction between various stakeholders was further intensified due to the analyses. This provided the means for all parties to learn from the various viewpoints that were included in the pricing decisions, which was perceived as highly important. Some new requirements toward the system appeared to simultaneously emerge. The cost information was, for instance, perceived to be too detailed and different activities and cost elements were combined to represent wider entities. The cost calculations were also visualized by using various graphs to illustrate the dynamism between the decision-making variables and their cost implications. It was important to be able to recognize and understand the causal mechanism through which the costs were affected, instead of simply receiving the likely end result. The sales manager also became concerned with the price that was eventually charged to the end customers, and therefore wanted to broaden the scope of the system to also include the contribution margins of retailers and value added tax in order to take into account certain psychologically important price levels (e.g., €1.99). Therefore, it became possible to determine the targeted price for the end customer, together with the assumed contribution margin of the retailer, and use the derived target price to guide the product development process.

The use of the costing system was slowly extended into the biannual price changes and pricing of one-off special orders. In order to support the price changes, the product costing cycle was synchronized with the biannual price changes so that the newest cost figures were always obtainable when the decisions were made. Moreover, if some more radical changes were considered, the pricing tool was used to analyze the likely outcomes by using the current situation as a baseline. Various comparison possibilities were also included in order to simplify the detection of differences between the scenarios. The tool was also used to analyze the short-term pricing opportunities when such occasions occurred. The company was about to abandon a certain big one-off special order for European markets, which didn’t satisfy standard requirements that were placed on cost recovery. However, with the assistance of the researchers, the average cost calculations were modified to better represent the incremental costs and revenues of this order. This was conducted by holding some costs as fixed in relation to the decision (e.g., majority of sales/marketing and administration costs), by adjusting some costs to better represent the consequences of the decision (e.g., only a few extra batches were actually needed) and by changing the valuation of direct labor to represent the more expensive night hours that were actually needed in order to fulfill the order. As a consequence of these modifications to the long-term average cost figures, the calculations showed that the order was actually extremely profitable and it was taken in. It appeared that this instance actually revealed the true meaning and importance of the variable/fixed cost classification for the company executives. Although they were familiar with this classic dichotomy, they could not really understand the implications it had for the decision-making. The first real short-term pricing decision provided an opportunity to learn the way in which the individual orders could significantly improve profitability, even when sold below the average prices. As a consequence, the representation of cost elements was ordered to better reflect the division between the variable and fixed costs. Moreover, some pricing decisions were started to be routinely analyzed on the basis of their marginal demand for activities.

The use of cost information to support other pricing related decisions also began gradually. The benefits of truly assigning some costs to retailers and retail chains became especially apparent when it became possible to analyze the retail chain level costs by certain geographical area. Table 8 illustrates one such retail chain/geographical area level analysis concerning delivery costs.

Table 8. *The share of delivery costs from total sales.*

Retail chain	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Average
Retail chain 1	16%	13%	17%	12%	12%	6%	**12%**
Retail chain 2	12%	17%	20%	18%	8%	20%	**14%**
Retail chain 3	46%	67%	60%	73%	52%	66%	**58%**
Other retail chains	34%	37%	62%	8%	38%	49%	**20%**
Total	**20%**	**24%**	**27%**	**22%**	**15%**	**18%**	**20%**

As Table 8 shows, the share of delivery costs in this specific geographical area varied considerably from one retail chain to another. If the delivery costs would have been assigned to retail chains as a proportion of total sales (as in the former system) or absorbed through the products that were bought (as would happen if the delivery costs were assigned to products), each retailer and retail chain would be reported as having similar cost structures. When the real differences were highlighted, alternative possibilities to improve the situation became evident. In this instance it was considered whether retail chain 3 should be served at all, whether the delivery days should be decreased to 3 per week, or whether an extra surcharge for small orders should be introduced. Despite these extensions in the use of cost information, some of the pricing-related decision (e.g., cooperative advertising decisions, promotions, etc.) were still made without paying a great deal of attention to the cost information. Therefore, although the cost information played a major role in many decisions, other important determinants also affected the pricing.

4.4. Perceptions of the performance of the redesigned costing system

It is probably not possible to make any inferences regarding the impact of product costing on organizational performance, but some observations regarding the use of, and the satisfaction toward, the system can be made. As already described, use of the product costing system began during the design process and many of these practices have also remained alive. In fact, the circle is now becoming complete, since the company is currently introducing a new ERP system with improved product costing possibilities. More importantly, the redesigned product costing system and related practices have had a permanent impact on the pricing processes. Therefore, not only have the decisions themselves been affected but the entire process through which these decisions are made has been transformed. The process of new-product pricing has become more transparent, utilizes the scattered knowledge of the organization more profoundly and is supported by cost estimates that are provided at the early phase of product development. The ability to provide fairly accurate product cost information in advance of actual production is especially perceived as highly important from the pricing perspective. It could be even stated that the entire purpose of product costing is now to provide a means for more reliable cost estimation. Therefore, product costing is primarily used to learn from the economics of the organization so that the costs and profitability of new products can be more accurately estimated and affected. Since the developed pricing tool standardized the economic analysis of new product concepts, it has become possible for the product development manager to provide initial preliminary product cost estimates even before making any test runs. As a consequence, some of the unpromising product concepts have now been terminated on the basis of these early cost estimates, while they previously commonly ended in the production phase.

The different parties have also started to adopt a somewhat permanent division of work, and the pricing has actually started to resemble a process with agreed responsibilities. The price and volume estimates are now provided without being requested, and the production managers are always aware of the information that must be provided in order to analyze the economic potential of various scenarios. Moreover, the roles of product development and production have been strengthened and they currently operate as more equal partners of sales and marketing (when making pricing decisions). Although the final pricing responsibility still lies firmly in the sales and marketing department, various viewpoints are discussed during the process. This improved communication and collaboration among the departments and individuals is also commonly held as being one of the most important achievements of the project. As the CEO of the company once explained, many of the problems encountered did not necessarily even ultimately stem from poor cost information, but rather from the poor communication between individuals and departments. Therefore, successful pricing decisions could probably have been made even without accurate cost information had the different problems only been jointly addressed. The problem was that each department was pursuing its own ends (e.g., maximization of sales volume versus efficiency of production), without understanding the functioning of the organization in its entirety. The product costing system and related pricing tool provided a common language (i.e., monetary implications) through which the different parties could discuss the various perspectives of pricing decisions. Therefore, they provided the means to learn from the functioning of the entire organization, which probably helped to align the goals of the different parties involved. The satisfaction toward the system may be equally related to its ability to work as a “communication device” between the various parties as to the accuracy of the cost information that is provided. The adopted responsibilities and interaction among the departments, as observed after the project and costing developments, are illustrated in Table 9.

Table 9. *The illustration of adopted responsibilities and the interaction between departments.*

Product lifecycle	Product development	Production	Sales and marketing
Product development and target pricing	• Product development possibilities • Preliminary cost and profitability estimates and corresponding "requirements" (e.g. assumptions regarding capacity, set-up times etc.)	• Support information for the product development (i.e. how different decision affect the production)	• Provision of product concepts • Market information regarding the similar products (i.e. prices, sales volumes etc.)
New product pricing decisions	• Recipes for products (i.e. ingredients, package materials etc.) • Test runs and needed changes in the requirements for the production	• Determination of production schedules, set-up times, capacities, labor needs etc. • Cost/profitability estimates of various pricing scenarios • Potentially needed investments	• Provision of different pricing scenarios and related sales volume estimates • Other marketing mix decisions like the delivery channels • Pricing games/ sensitivity analyses
Price changes and pricing of one-off orders	• Development of new product to the same product family (e.g. exploitation of synergies) • Potential face-lifts (e.g. package materials)	• Calculations regarding the realized costs and volumes (biannually) • Analyses of marginal cost implications of one-off orders • Potential investments on productivity	• Price change scenarios and related profitability analyses • Pricing of one-off special orders • Promotions, policies, contract terms etc.
Termination of products	• Ideas for substitutive products	• Implications to existing production and products • Marginal cost implications (i.e. the current capacity utilization situation)	• Analysis of sales volume and profitability trends • Plans regarding the forthcoming products

The sales and production managers also highlighted the importance of the project as a learning experience. The sales manager in particular pointed out that it was possible to actually learn from the functioning of the organization through the flexible use of the product costing system. Of importance was that the system did not function as a "black box" that provides only static unit cost figures (e.g., €1.20 per unit), but also visualized the causal mechanisms through which the different cost elements can be affected. For example, he sales manager was aware of the problems related to small batch-sizes, but didn't realize how expensive the set-up hours were or that the batch-sizes also had a severe impact on the waste percentages. It was also perceived as essential that the system was flexible and dynamic in the sense that various factors could be manipulated and results observed. Without the possibility to flexibly change the valuation principles of labor costs or the division between the variable and fixed costs, many analyses of incremental cost implications of short-term pricing decisions would not be made. Moreover, learning the importance of high capacity utilization and the possibilities to improve profitability through second market discounting would have not either occurred. Regardless of the accuracy of average product cost information, many one-off orders would be deemed as unprofitable without the understanding of the dynamism between variable and fixed costs. The company now even actively seeks these possibilities as part of their pricing strategy. It was the change in the way of thinking (stimulated by the learning through the costing system) that led to the exploitation of these possibilities.

As the example of the benefits obtained by a more profound understanding of the meaning of variable/fixed cost classification shows, the real value of cost system redesign might be related to challenging the current way of thinking. Several years after the project has ended, the CEO of the company commented that the biggest lesson for him personally was not learning a more accurate way of measuring product costs, but the change in the way profitability was understood. As described, the company used to allocate costs to products as percentage-based add-ons, and the profitability was largely analyzed in terms of contribution margin ratios. Therefore, each product was required to have a contribution margin ratio of around 40% in order to be profitable after the allocation of delivery, sales and administration costs. During the project it was realized that the production capacity of FinnBakery was actually rather fixed and business-sustaining costs should be covered with a fixed amount of production hours. Therefore, how much a single product unit could contribute to fixed costs (at least in percentage terms) was not as important as how much a single production hour could generate this contribution. The product's capability to generate contribution per production hour therefore provides a more "objective" way to compare the profitability of different products. This was also later chosen as primary way of addressing the profitability of products, and the company set some requirements for the products based on this measure. It is notable that this new way of thinking of the profitability was not directly related to the improved costing practices, and could have been used earlier. However, it was only the understanding of cost dynamism that made it possible to see the benefits that could be obtained by also addressing profitability from other perspectives. In Table 10, an illustration of the multiple perspectives used to analyze the profitability of products is presented. As the table shows, some pricing scenarios might be more robust to unpleasant surprises in sales volumes (i.e., compare the worst cases of scenarios 1 and 2) and the relative profitability of scenarios may be dependent on the measure that is used (i.e., compare the different profitability measures of mean cases). Moreover, it is possible that some products have almost identical contribution margin ratios, but others are capable of generating almost four times as much contribution in relation to required production hours (i.e., compare product Y and product X). This is typically the case with breads that preserve and can be baked in long production runs.

Table 10. *Analysis of alternative pricing scenarios.*

	Product Y: Pricing scenario1			Product Y: Pricing scenario2			Product X
Profitability measures	**Worst case**	**Mean**	**Best case**	**Worst case**	**Mean**	**Best case**	**Realized**
Price (€) Assigned costs (€) Volume/month (units)	€ 1,20 € 1,18 8000	€ 1,20 € 0,95 13 000	€ 1,20 € 0,87 18 000	€ 1,05 € 0,94 14 000	€ 1,05 € 0,84 21 000	€ 1,05 € 0,76 28 000	€ 2,50 € 1,94 20 000
Contribution per unit (€) Contribution margin (%)	€ 0,02 2 %	€ 0,25 21 %	€ 0,33 28 %	€ 0,11 10 %	€ 0,21 20 %	€ 0,29 28 %	€ 0,56 22 %
Contribution per month (€) Contribution per hour (€/h)	160 € 6 €/h	3 250 € 117 €/h	5 940 € 186 €/h	1 540 € 54 €/h	4410 € 127 €/h	8120 € 196 €/h	11 200 € 504 €/h

Finally, it should be noted that although the product costing system was intended primarily for use in pricing, use of the system expanded into new areas during the design process. The product cost information has been used, for instance, to reformulate the production strategy, to assist in budgeting and to provide justification for investment decisions. It also played a central role when the company decided to terminate one production department and outsource the production of pastries. In all these cases, the use of the system has not focused so much on the unit costs, but rather on the aggregate measures (e.g., labor costs, production hours) and how they are affected by the decisions. These analyses have also commonly meant some alterations to the allocation structures and manipulations to activity cost rates, so they would have not been possible without the flexibility of the system.

5. FinnMechanics: an international machine manufacturer

5.1. Overview of the case company and its operational environment

FinnMechanics is an affiliated company of a large family-owned Finnish machine manufacturer with over 40 years of history. The group as a whole focuses on different indoor climate technology solutions and has operations in over 20 countries. It employs over 1000 employees, and the annual turnover is in excess of €150 million. FinnMechanics comprises the second biggest strategic business area of the group, with around 200 employees and an annual turnover of €30 million. It produces climate technology solutions for the marine industry, consisting of cruise, navy, and oil and gas business segments. Typical products include fire dampers that prevent fire from spreading in ventilation ducts, and complete ventilation systems for cabins and galleys. The global markets for these products are rather small and highly concentrated, both in terms of buyers and sellers (especially at the high-end, where FinnMechanics competes). This is highlighted by the fact that FinnMechanics is among the market leaders in almost all the product categories in which it competes, and has only a few direct competitors. The number of small emerging competitors from low-cost countries is currently increasing, but the strict safety and quality requirements have so far prevented them from truly competing for the same customers/markets. Furthermore, the number of potential buyers is rather small and fewer than 50 customers generate virtually all the turnover. Therefore, relationships with these key customers are highly important and the entire business strategy is built on their retention. Entirely new customers rarely enter the markets, due to the high entry barriers (e.g., the capital intensity of projects), so it is extremely hard to replace lost sales. Therefore, the business context is a rather typical, oligopolistic, business-to-business market, in which buyers also have considerable negotiation power, due to their importance to sellers.

The products of FinnMechanics are commonly used in unique ship- or oil-rig-building projects, so they must be tailored to fit particular customer specifications. This was previously achieved through the time-consuming engineering-to-order (ETO) process, but nowadays a more efficient mass customization approach is pursued. In this approach, a large variety of products is efficiently produced by taking advantage of modular product structures, flexible processes and sophisticated information technologies (Da Silveira et al. 2001). In the instance of FinnMechanics, this implies the use of configuration models that define the product space within which any product variant can be produced without separate design activities. These configuration models are incorporated into a sales configurator, which assures the feasibility of the product variants by checking the completeness (i.e., each mandatory characteristic has value), the validity (i.e., each characteristic has permitted value), and the compatibility (i.e., a combination of characteristics is permitted) of various configuration options. The actual configuration process is divided into sales configuration and technical configuration. In the former, the best solution for the customer is sought by using the sales configurator to represent the configuration options and their price implications. This results in a sales configuration that defines the product characteristics in commercial terms. In the technical configuration process, this is translated into specific product documentation, which is no more interesting for the customer. In practice, the technical configuration process identifies the components and process steps that are required to produce the product variant, and which are further used to formulate bill-of-materials, routings, and production sequences/schedules. The generic structure of a common two-stage configuration process is illustrated in Figure 19.

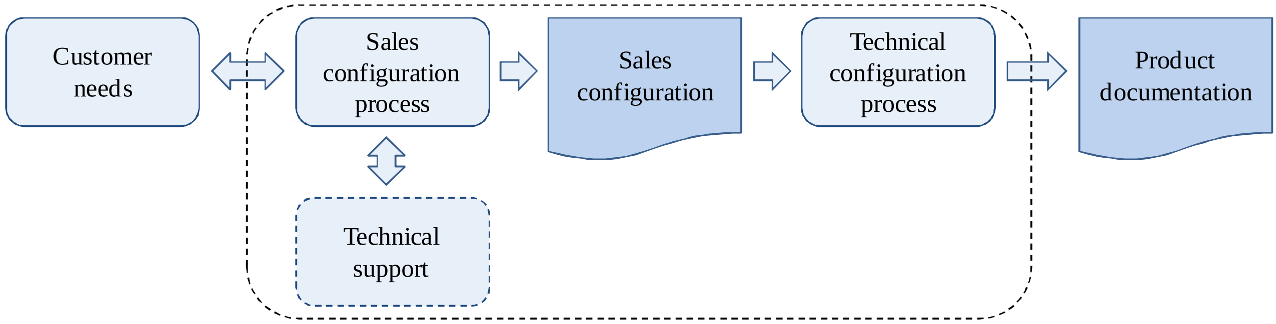


Figure 19. *An overview of the two-stage configuration process (adapted from Forza & Salvador 2008).*

As the use of configurable products structures suggests, the product variety of FinnMechanics is extremely high and no standard products exist in the conventional sense. The company essentially produces only approximately 20 primary products (or product families if the terminology used in mass-customization literature is adopted), but each of these has multiple configuration options, through which the actual product variants are defined. These configuration options include both freely determinable parametric dimensions (e.g., the length of the product) and a discreet/pre-defined option lists (e.g., the material for the frame of the product). As a result, almost all the produced product units are somewhat unique and completely similar variants rarely leave the factory floor. Although most customer requirements can be met through these configuration options, there are also some occasions when specific customer needs cannot be fulfilled within the defined product space. This is especially true of large projects for oil and gas segment, where the specifications are commonly much stricter than for cruise segment. Typical special requirements are related to the use of components from specific suppliers and the changes required in product interfaces. These structural design changes, together with the associated design tasks, may appear to be rather minor from the functional perspective, but they are commonly catenated and cause a great deal of extra work in product development, procurement, and production. For example, if the actuator of the fire damper is changed to one that is not incorporated into the current configuration model, the entire motor mount and related interfaces must be redesigned. This all highlights a need to retain flexibility in processes, and production that is organized around small functional work centers instead of static production lines.

The characteristics of the markets and products naturally set the context in which the pricing decisions are made. Since the sales configurator must be capable of immediately producing prices for all possible product variants during the sales configuration process, the pricing must be automated to some extent. This is achieved by running specific price models in the background of the sales configurator, which exploit simple rules of calculation to produce prices for product variants. Despite this need to produce ex-ante prices for unique configurations, the product variants are actually commonly bundled into larger projects that might consist of up to 500 different product variants. In these instances, the customers are likely to organize separate competitive bidding where the total price for the project is a great deal more relevant than the composition of that price (i.e., the prices of product variants). Therefore, the company requires both the ability to provide fixed prices for various product variants and the skills to flexibly address the pricing of larger projects on a case-by-case basis. Given that the products are highly customized and rarely identical to one another, the industry is not characterized by any clearly observable market prices. This makes it difficult for the customers to judge and compare product prices on the basis of previous experiences. Moreover, since the product offerings between the competitors are rarely equal, the direct comparison of different quotes is also somewhat challenging. This is highlighted by the fact that even the sales managers of FinnMechanics have only a vague idea of relative price levels among the main competitors. It is somewhat “known” that FinnMechanics is generally around 10% more expensive than its primary competitors, but there is a poor understanding of how the project offerings actually compare to one another. In fact, it appears that the purchase decisions are not directly linked to differences in prices and that many other, probably even more important, competitive factors affect the decision-making. The established relationships among the parties seem especially to play a major role in purchase decisions, and the supplier is rarely changed simply because of lower prices.

The earning logic of FinnMechanics is rather straightforward, since the net sales almost solely consist of direct product/project sales. The company naturally has some additional services and spare parts business, but these currently do not generate any significant proportion of the turnover. They do have a certain role in boosting sales and winning the projects, but the financial success is directly linked to the profitability of product/project sales. Since customer characteristics vary considerably, and comparison of prices is difficult, profitability is pursued by price differentiation among the orders and customers. Customer willingness to pay is dependent, for instance, on the business segment (e.g., cruise segment is much more price-sensitive than oil and gas segment), and so any single set of fixed prices would leave profits on the table. But although prices may vary considerably from one customer to another, there must be some price stability within the specific customer relationship. This is visible in occasional short-term pricing opportunities, where it would be possible to exploit the dominant market position. For example, the end customer (e.g., oil drilling company) might have specified that the contractor (i.e., the direct customer) must use FinnMechanics as a supplier, which gives the company a highly powerful negotiation position. However, since the same contractor might still be capable of inviting the competitors to tender for other projects, the position is not exploited in the pricing (i.e., it would have a negative impact on the customer relationship). Therefore, long-term price stability and profitability is pursued even if it means that some short-term pricing possibilities are lost. Furthermore, price is not used as competitive weapon, in the sense that the winning of contracts would be pursued by significant short-term price reductions. During the recent economic crisis, FinnMechanics retained its price levels although the output volume almost halved.

5.2. Description of product costing practices and use of cost information in pricing

In FinnMechanics, pricing is not primarily associated with the determination of price for a new product. In fact, completely new products are rarely launched, since product development is more concerned with improving existing products in accordance with ever-tightening regulations and customer specifications. Therefore, product prices are not fixed once and for all, but each order and product variant represents its own unique pricing situation. The pricing of product variants and orders can take two alternative modes, commonly referred to as “list pricing” and “project pricing” within the company. The list pricing approach is used with the customers that typically place many low-value orders that fall within the product space of configuration models. Therefore, the fulfillment of orders does not need any ETO changes or the use of special components. For these customers, separate price lists are generated by using the price models of the sales configurator. These price lists define the prices for various products and their configuration options. However, since there is a need to differentiate these prices from one customer to another, the sales configurator actually produces only standard “gross prices”. The actual “net prices” that are paid by the customers are determined by exploiting discount profiles that are annually or biannually negotiated with the customers. Therefore, the general price lists are determined by utilizing the price models of the sales configurator, and the price differentiation among customers is achieved by using customer-specific discount profiles. Once the discount profiles have been agreed and price lists published, the actual order process becomes highly mechanistic and is partly automated. As a result, these customers and orders hardly burden the sales representatives or product development personnel. Figure 20 illustrates a pricing process that is based on the use of list prices.

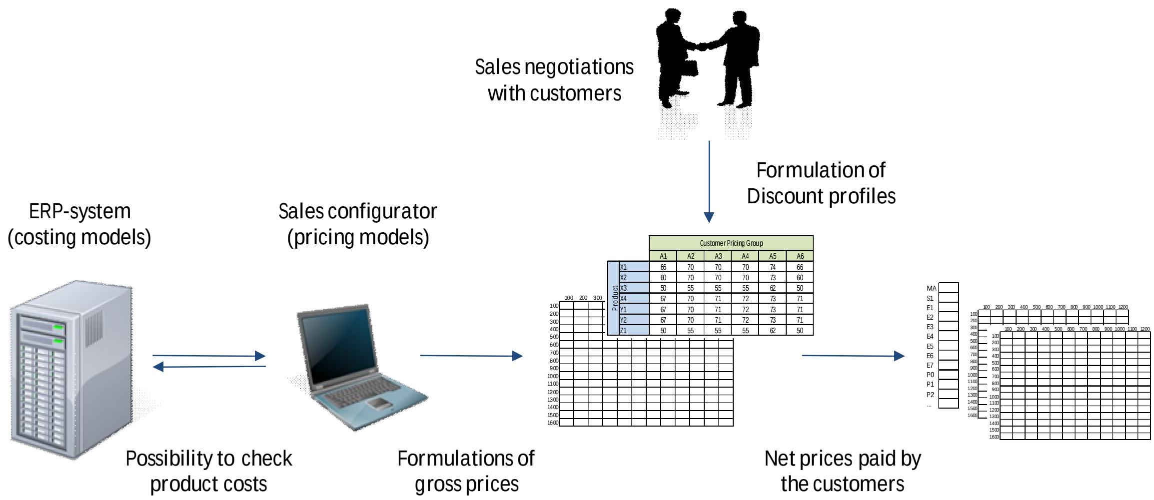


Figure 20. *Overview of pricing process based on the list prices.*

The project pricing approach is used with those customers who buy larger occasional projects and organize competitive bidding among the producers. The value of these projects is commonly many times higher when compared to orders from customers operating with the price lists, and they are further characterized by the use of special components and changes to product structures. Therefore, they cannot be produced within the product space defined by configuration models, which also means that they cannot be priced using the standard price models. These price models are nevertheless used to provide a common starting point for pricing decisions. In practice, they are used to price the basic steel structures of products (by selecting corresponding products without any optional features) that rarely change significantly. Equipment and accessories are then priced separately in an Excel spreadsheet by using the purchase prices and rather standard contribution margin requirements as a basis for the pricing task. Finally, the prices of steel structures and accessories are totaled in order to formulate the prices for various product variants, which are then used to determine the price for a project as a whole. This price might be altered slightly on the basis of the characteristics of the project (e.g., the complexity of ETO changes), market factors (e.g., the relationship with the customer) or competitive situation (e.g., the number of other bidders), but it is usually used rather straightforwardly as a tentative first offer. The actual price differentiation is then based on several negotiations runs with the customer, through which the final price is formulated on a case-by-case basis (the final specifications might also still be alive at this point). Despite the small concessions that are commonly made during this process, the final prices are usually fairly close to those that were originally set.

As described, price models play a significant role in decision-making. In principle, they are simply a set of rules of mathematical calculation that determine the price for a product variant on the basis of its configuration options. In practice, they divide the products into basic steel structures that are priced on the basis of their central dimensions and materials (i.e., length, width, depth, thickness, material) and various accessories for which separate price lists (i.e., commonly purchased price plus a certain contribution margin) are maintained. The prices for various product variants are then formulated by summing up these components on the basis of the selected configuration options. Although these price models were originally built on top of the product cost estimates, the connection between prices and costs was lost many years ago. This is primarily because price models do not actually refer to any product cost estimates, but are only regression models that were once formulated on the basis of these estimates. Therefore, price models are not based on constantly updated product costing rules, but on the results of a one-off analysis that was conducted around 10 years ago. The price changes have simply been made by annually increasing all the prices by a fixed percentage that is derived on the basis of the changes in the overall cost structure (i.e., primarily inflation of material and labor prices). Since the relative prices of different sheet metal materials have changed dramatically since the introduction of price models, no one nowadays appears to know how the prices of different product variants reflect their production costs. The possibility of checking the actual product cost estimates from the ERP system remains, but it is not regularly used since these practices are outdated and do not any better reflect the current situation. As a consequence, the sales representatives appear to be at the mercy of price models that they cannot completely understand.

Despite the importance of ideologically cost-based pricing models, the product costing practices of FinnBakery were very simplistic. Although the ERP system (SAP R/3) also supported many “sophisticated” product costing practices (e.g. ABC), the company had implemented only a simple standard costing system that attempted to estimate the direct material and labor costs, based on the bill-of-materials and routings. Since each product variant is composed of somewhat different (at least in their dimensions) parts, components, and work operations, these bills-of-materials and routings must be formulated on a case-by-case basis. This is accomplished by utilizing the selection rules that automatically match the configuration options with the corresponding materials and operations. These selection rules are not necessarily linked to the header level of product structure, but also to various subassembly and part levels that constitute the final product variants. For example, each sheet metal part has its own cutting and bending operations, but might also relate to the welding of a frame or assembly of a final product variant. The product cost estimates are formulated by totaling the materials and operations that are required to produce the specific product variant. The system also utilizes two different overhead rates for labor and materials, but these are not intended to cover any genuine manufacturing overheads (e.g., supervision of work), rather, they attempt to take into account certain small supporting operations or materials that are not included in current routings (e.g., material movements) or bill-of-materials (e.g., screws). The standard costs are accumulated into cost centers in order to compare them to actual cost figures. Although this should enable the updating of standards, these practices have deteriorated during recent years. At the beginning of the cost system redesign project, the standards were capable of covering under two thirds of the labor costs that were actually incurred in production. Figure 21 provides a simple illustration of how bills-of-materials and routing are formulated, with corresponding standard material and labor costs.

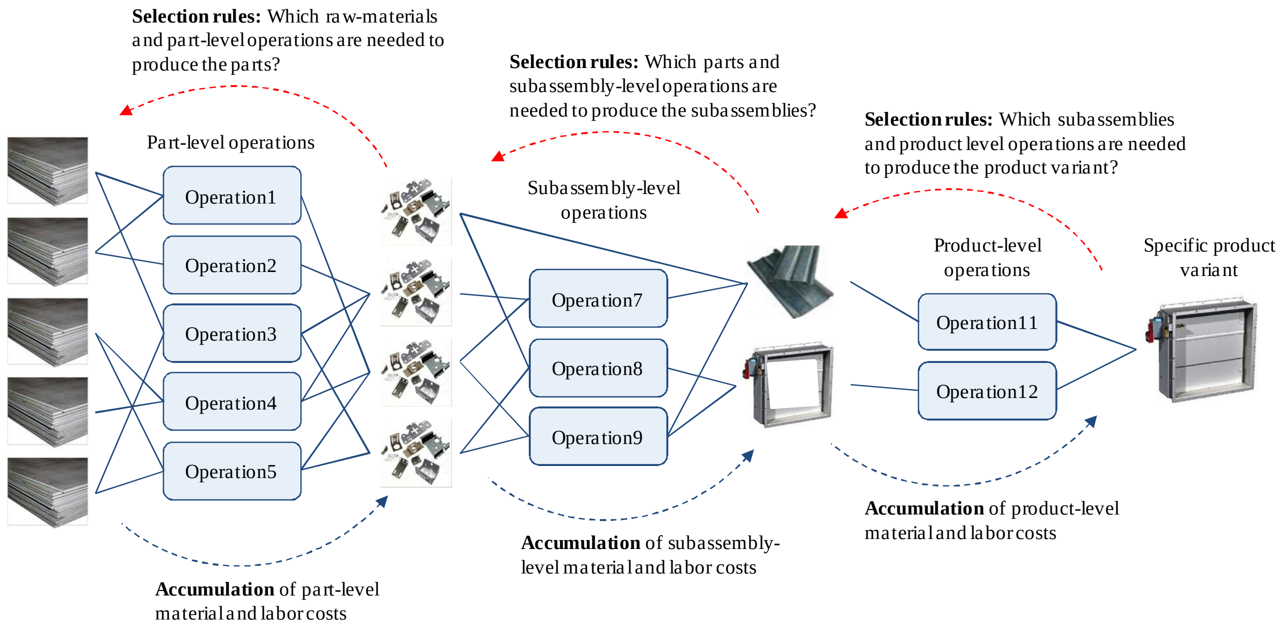


Figure 21. *The formulation of configuration specific bill-of-materials and routing.*

Given the state of product costing and pricing practices, FinnMechanics had some problems relating both to product costing and the use of price models. The biggest problem in product costing was that the differences in time required to produce various product variants could not be reliably estimated by the standard operation times. The selection rules assigned different operations to different product variants, but did not take into account the differences in time required to perform these operations. In fact, the system assumed that each product with identical operations was equally as time-consuming and costly to produce. The only difference in labor costs was based on certain operations that were not assigned to all product variants and certain operations that were assigned multiple times when, for instance, the product size increased. In practice, the size of the product rarely changed the required operations, but simply made them last much longer. As a consequence, the standard costs did not reflect accurately genuine variations in the cost structures of product variants. Since all the product variants had almost equal standard labor costs, it would be easy to postulate that simple and small configurations were likely overcosted, while complex and large configurations were undercosted. However, since the standard costs were not even close to encompassing all the costs that were actually incurred, simple configurations may also be undercosted in absolute terms. This problem was made worse by the fact that the same standards were also applied to the product variants that actually required ETO changes. As a result, the extra requirement of product development was not accounted for in product costing, and the more costly production of these product variants was also neglected. For example, the assembly of ETO-designed products may consist of exactly the same activities, but they may take much longer, as the assemblers always have to browse through all the drawings and notes. Without any cost information from these implications, it is difficult to take into account ETO-incurred costs in project pricing. Furthermore, even if accurate and timely cost information were available, the current price models would not be capable of using it.

There were also some more ideological problems relating to the current use of the pricing models. First, the models were additive by nature, meaning that the costs/prices of features were always simply totaled in order to reflect their joint effect. In practice, there are many interdependencies between the features, and the assumption that the cost of providing two features together is the sum of providing them separately is not valid. Second, the price models always focused on the pricing of product variants, although they were commonly bundled together. From the production perspective, the individual product variant is a natural unit of analysis, but pricing should also pay attention to the characteristics of the entire project. There were considerable differences related to order sizes, terms of payment, sales work required, documentation requirements, and inspection, etc., which could not be accounted for via price models that focused only on product attributes. As a result, two virtually similar projects with similar prices may have highly different profitability. The problem was that no one knew for sure, which projects were the profitable ones. The product-oriented sales configurator concentrated the focus of the pricing process on different features of products and not on the project that was actually sold to the customer. Third, the price models produced gross prices that were significantly higher than the actual net prices that were paid by the customers (i.e., typical discount percentages were at least 60%). This obscured the actual price levels and made it easier for the sales representatives to give additional “small” concessions. However, since the gross prices were highly inflated, even a 1% additional discount (e.g., 75% instead of 74%) may have a significant implication for profitability. This also contributes to the assumed high variation in the profitability of different orders. Moreover, since identical discounts are given for all product features, the differences in customer valuations cannot be addressed. Therefore, certain customers have begun to order only products with certain configurations from FinnMechanics, while others are purchased from competitors.

5.3. Cost system redesign process

Although the problems with the product costing and pricing practices had been visible for many years, FinnMechanics had not taken any considerable action to correct the situation before the launch of the present research project at the beginning of 2009. This might have been somewhat due to the fact that the company had been fairly profitable throughout its lifetime, so there had not been any immediate impetus for change. However, during recent years, price competition has increased and customer requests for discounts have become higher. Moreover, the emerging threat from Asian competitors has become more apparent, so these factors together provided the thrust required to begin a cost system redesign project. The purpose of the project was to update product costing practices to better fit the context of configurable products and to develop pricing processes that take advantage of this improved understanding of product costs. Although the pricing was clearly set as the intended purpose of use for the product cost information, it was initially the concern of the business controller and CEO, rather than the sales managers of the company. The sales managers were supportive of the project (i.e., they all believed that a more profound understanding of the profitability of product variants, products, orders, and customers was important), but they simultaneously appeared to be capable of handling the prevailing situation fairly well. Subsequent discussions revealed that in reality they were not even familiar with all the existing problems of product costing (e.g., the fact that the operation times did not lead to differences between the product variants), but simply trusted the price models that, on average, had provided satisfying results so far. The core project team was established around two researchers, the business controller, and the SAP R/3 system specialist, although the production and sales managers were also naturally heavily involved in the design process. The role of the SAP R/3 system specialist was particularly important, since it was perceived as essential for the development of the costing practices to be guided by the functionality of the ERP system and possessed skills regarding its use. Given the enormous costs of tailoring the system and/or existing interfaces (e.g., the sales configurator), the use of current systems and their established structures was unquestionable.

The early phase of the project focused simply on gaining a greater understanding of the production processes and the nature of the business in general. It soon became apparent that the existing product costing practices had been primarily designed for the standard products, while FinnMechanics rarely produced even two identical product units. This was also literally true, since the prevailing practices had been adopted from other business segments that produced far more standardized products. Therefore, the first step was to agree that the costing system would be translated to more resemble a job-order costing system, whereby each product unit may separately represent a cost object. In practice, this already happened with regard to material costs and the problem lay with the standard operation times used to estimate the labor costs of production. In a typical job-order costing system, direct labor costs are traced to individual jobs by using separate time sheets that register the time required to produce each job (Horngren 2012). This would also have been possible in FinnMechanics, since almost all the labor costs of production were direct to product variants (i.e., there were no genuine joint processes). However, the actual tracing of direct labor costs was perceived as too burdensome, since it would have required thousands of time registrations per day. Moreover, the company would still have been required to build completely new tools (e.g., a program that enables it to find a best match between a new product variant and one already produced) in order to benefit from this information in pricing. The amount of time registrations could have been dramatically reduced by tracing labor costs to orders instead of product variants, but this was perceived as being even more useless from the pricing perspective. Since the content of different orders varies considerably, the product variant level cost information would still have been required in order to estimate the cost implications of forthcoming orders. Ultimately, the purpose of product costing was rather to approximately estimate the costs of different product variants in advance, than to calculate/measure them accurately afterwards. Therefore, it was agreed to maintain the standard costing approach, but the standards were redeveloped to allow for estimation of the cost differences between the product variants. These same standards could then subsequently be used to build price models to the sales configurator.

The greatest potential for improving product variant-level cost information was viewed as lying with direct labor costs, and it was there that the majority of the actual development inputs were first directed. As the business controller constantly emphasized, the material and labor costs of production formed around two thirds of the total costs, and it would be a major improvement if these could be more accurately assigned to product variants. Therefore, the cost system redesign was begun by more profoundly analyzing production processes and by updating the existing cost and work center structures. In practice, five existing cost centers were divided into 13 new cost centers, which were then further divided into various work centers (i.e., the standard structure in SAP R/3). For example, the entire sheet metal cutting process represented a cost center, while different sheet metal cutting machines were handled as separate work centers. A more detailed cost center structure enabled the comparison of standard and actual cost data in a more specific manner, since, for instance, the costs of cutting and bending resources were no longer mixed together (i.e., the cost centers became more homogenous in terms of their output and resources). This helped to keep the standards updated, since the identification of systematic deviations and their sources become somewhat easier. Moreover, if the company later wants to assign actual costs from the cost centers to product variants, the redefined structure should enable more accurate cost assignments. In addition to the splitting of existing cost centers, completely new cost centers, which broadened the scope of the product costing system, were also established. For example, all the finishing operations (e.g., painting and galvanization) that were actually performed outside the company had not previously been assigned to any cost centers or even described in routings. These costs were nevertheless clearly direct to product variants, and could have been assigned to products by using weight as a cost driver (i.e., the billing basis was the weight of a product variant). The establishment of separate cost centers for these operations made it possible to trace the actual costs of finishing to corresponding cost centers, and also to consider these costs in routings/operation standards.

When the more detailed cost center structure had been agreed, the operations conducted by various work centers were reviewed and updated in close collaboration with the production manager. The number of different operations was first increased from around 20 to 50, which was achieved both by splitting some general operations into those that were more detailed, and by adding some completely new operations (e.g., finishing operations). The more subtle operations structure enhanced the system's ability to cope with the product variety in two ways. First, it was possible to better reflect the actual differences in routings when there were more operations describing the production processes of various product variants (e.g., all the products have assembly operation, but this might consist of different sub-operations). Second, the behavior of operations was easier to model, since the more detailed operations have fewer variables (i.e., cost drivers) that cause significant variability in operation times. The next major step was to analyze each process and operation separately and to identify the most important cost drivers. The analysis revealed that the duration of each operation was typically dependent on one to five variables and in total each product had from 10 to 20 significant cost drivers. For example, the time required for sheet metal cutting was primarily determined by the cutting speed of the machine and the length to be cut. Since these variables were fixed by the dimension and material selections of the product variant, it was possible to establish calculation rules that linked together the configuration options and the time required to perform the sheet metal cutting. In practice, the cutting length of each individual part could be at least approximated by using the major dimensions (i.e., length, width, and depth) of the product variant, while the cutting speed was determined by the material selection (i.e., thickness and material). Using these variables, it was possible to calculate the individual cutting time for each part, which could then be further totaled higher in the product structure. This basic idea of feature-based costing (c.f. Niazi et al. 2006) is illustrated in Figure 22, using the sheet-metal cutting operation as an example.

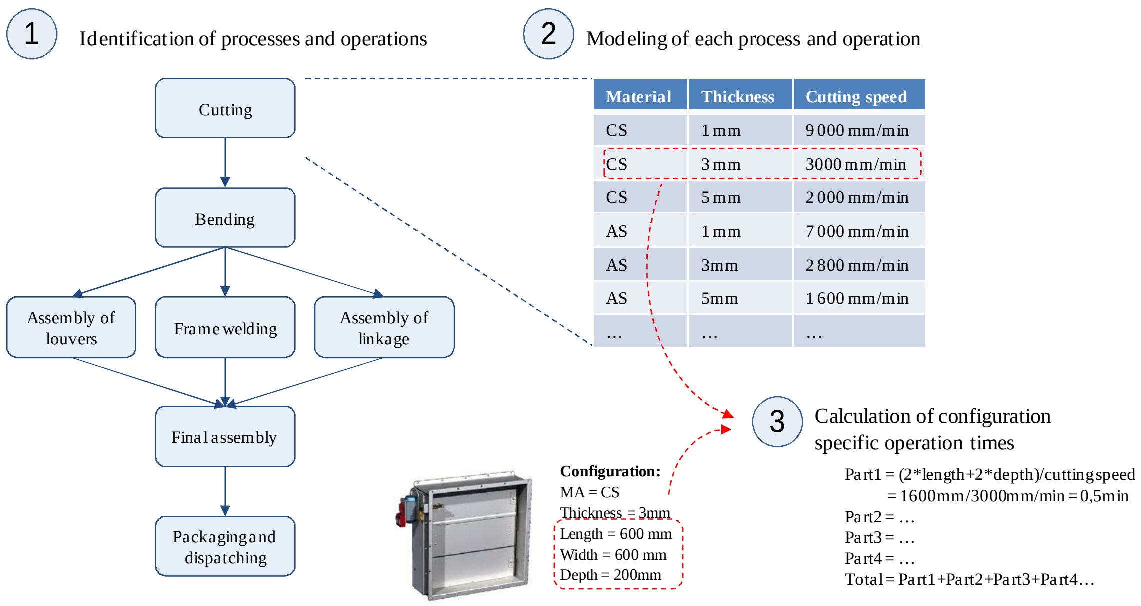


Figure 22. *Illustration of the basic idea of feature-based costing.*

In the majority of instances, the process of formulating linkages between the cost drivers and operation times was far more complex than illustrated in Figure 22. For example, the number of significant cost drivers could be higher, and they might exert some combined effects on the operation times. On some occasions, the time functions could have almost 10 different variables and constants determining the individual time required to produce a certain product variant. Moreover, the relationships between the configuration options and operation times were commonly not measurable, but had to be established on the basis of the interviews (i.e., estimates given by employees) or a few observations (i.e., time registrations). One particular interesting cost driver was ETO changes, which clearly also caused some extra work in production operations, but could not be estimated particularly accurately in advance of production. Their impact was still approximated by a standard time that was added to some assembly operations if any structural changes were to be made. Although this extra time could, to some extent, reflect the average effect of ETO changes on the production process, the burden was rather perceived as a way of ensuring that no incentive to make unnecessary changes outside the configuration model was given to sales representatives. For example, one member of the project team stated that the impact of ETO changes should be "big enough" to make it sure that these product variants ultimately carry all the extra costs they are incurring. Given all these sources of uncertainty and variability, it was evident that the established calculation rules could not accurately reflect all the differences between the product variants. This possible lack of accuracy was not still perceived as being a problem, rather, a highlighting of the simplicity and maintainability began. Therefore, many of the established time functions were actually simplified later in the design process and many minor cost drivers were simply ignored. For example, the impact of size was commonly modeled by using linear regression between certain end points, although there were clearly some important thresholds in the middle. As the business controller once pointed out, the purpose was to make visible some of the major differences between the product variants, not to accurately measure the impact of these differences. Ultimately, there was so much random variability in the processes (e.g., the impact of the individual performing the operation) that it did not pay to focus on any minor factors.

When the time functions of the operations had been established, their capability was tested in order to give credibility to the costing practices, as the company did not want to implement these functions in the ERP system before ensuring that they actually produced reliable results. The necessary tests were made by simulating how past production would have accumulated labor costs in relation to actual costs that were incurred. These simulations revealed that the standards did not actually incur all the production costs that were targeted, and that the differences varied from 10 to almost 50%, depending on the cost center in question. This was partly anticipated, since the standards were not attempting to take into account the various small assisting tasks and general inertia that occurred in each cost center. The difference between the actual and incurred costs could have been labeled as indirect labor cost and allocated to product variants by using the direct labor as a cost driver. However, the company also wanted to include these costs as part of the standards. First, the standards would then cover a higher share of the costs that were actually incurred in production. Second, there would be a clear-cut distinction between the costs that were included in costing models and the costs that required separate analysis. Therefore, the standards were modified to incur all the "direct" labor costs of production by using the actual production mix and volume, together with the related costs from the year 2009 as a baseline; i.e., the standards were modified to ideologically represent the average time used to perform each operation in a situation of efficient capacity utilization. The modified standards were further tested by using different time frames as a basis for similar simulations, which were perceived as providing sufficiently good results in order to implement the standards into the formal ERP system. In total, it took almost 2 years for the project team to arrive at a point where all the operations were finally modeled and could be compared in relation to original standards. The differences between the original and established standards are illustrated in Figure 23, through some randomly selected product variants (within a certain product). Only the corresponding operations are included in the comparison.

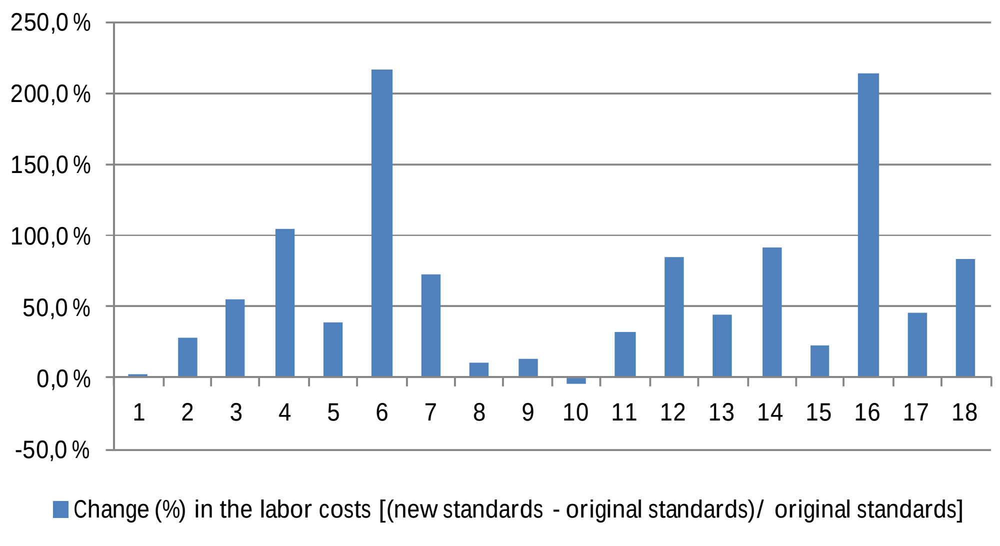


Figure 23. *Proposed changes to labor costs of randomly selected product variants.*

As Figure 23 clearly indicates, the proposed changes in labor costs varied from minuscule cost decreases to major cost increases, when compared to original standards. This also appeared to be the case in general (i.e., the results were similar with regard to other products), although some more standardized products encountered only minor changes. The pattern of proposed changes was also clearly observable, since their magnitude increased hand-in-hand with complexity of product variant. Therefore, all the particular instances in which there were major changes were large product variants with multiple selected configuration options. When these results were presented to sales managers, the interest towards the costing project was clearly momentarily increased. However, the reactions were rather mild, since the general direction of changes had already been anticipated, and it remained difficult to derive any real implications from the cost figures. Since the sales managers were accustomed to working with the price models, and not with the product cost information, it was difficult for them to judge the actual meaning of the fact that the labor costs of certain product variants were three times higher than previously “supposed”. Ultimately, the prices of the complex product variants could still fairly well cover these costs, and provide enough contribution to fixed costs and profits. This also appeared to be the case when the labor and material costs were compared to prices suggested by the price models. In fact, large and complex product variants still appeared to have at least equal contribution margins (in percentages) when compared to small and simple variants. In practice, the contribution left to cover all the remaining costs of the company could easily vary from €50 to €2000, depending on the particular product variant in question. Given the fact that some customers had already began purchasing only small and simple product variants from FinnMechanics, this raised the question of whether the prices of large steel structures and certain configuration options should be reduced. However, it did not lead to any instant changes, either in list or project pricing, since the company lacked the processes through which it could have exploited the improved understanding of product costs. Although it would have been possible to estimate the material and labor costs of new projects, there were no established practices regarding the way in which final prices should be affected. Therefore, the actual prices should still have been derived from the price models.

It would have been possible to broaden the scope of the cost system into other cost elements after the labor costs of production had been modeled. However, seeking ways to exploit the improved understanding of direct costs was perceived as being more important than attempting to include some indirect costs elements in the costing system. Therefore, only general material and labor overhead standards (describing the impact of some minor tasks and materials) were calculated and no other indirect cost allocations (e.g., costs related to supervision of work etc.,) were made. The business controller and sales managers saw some potential value in these allocations, but simply not at this stage. First, it was perceived as being more important to obtain some final results at this point, in order to keep alive the interest of different people. Second, the business controller and SAP R/3 system specialist feared some additional problems would occur with financial accounting and inventory valuation rules if other fixed-cost elements were also assigned to product variants. Third, it was argued that the share of manufacturing overheads was rather small and it would not necessarily pay to establish any complex practices to handle these costs more profoundly. Fourth, it was also felt that the changes that had been made to existing procedures were already quite radical, so it could be difficult to cope with any additional changes. Although the business controller in particular wanted to keep open the option of allocating some indirect manufacturing costs to products in the future, the potential to allocate any administration overheads to products was rejected unequivocally. People simply did not see any observable relationships between administration overhead costs and product variants that would have justified the cost allocations. In principle, it could have been argued that each product variant almost equally burdened the support functions, but this type of allocation would have led to the reporting of all small and simple product variants as extremely unprofitable. Ultimately, the pricing problem is not that each product variant should equally contribute to fixed costs, but that all product variants should jointly cover these costs. Although this essentially reflects the idea of dividing costs into fixed and variable components, this classification was also regarded as meaningless. In reality, almost all the costs (except direct materials) were fixed in relation to commonly made short-term pricing decisions.

Although the indirect cost allocations to products were rejected, the sales managers saw some potential in assigning these costs to other cost objects. The alternative cost objects with the most potential were projects, customers and customer segments, since most of the product variants were sold as part of a certain project and to a specific customer/customer segment. For example, the ETO design work, delivery costs, and documentation costs could be quite easily traced to projects, although it would have been difficult to burden the individual product variants with them. Alternatively, the design costs could be pooled together and allocated to projects by using the number of design changes as an activity driver. It would then be possible to use this activity rate to estimate the costs of design work in forthcoming projects. In a similar manner, there would be some costs that could be traced or allocated to customers or customer segments. This kind of project- and customer-level cost information could especially benefit project pricing, since it would help to pay more attention to project and customer specific variables. Customer-level information would also be beneficial in the negotiation of discount profiles. However, this would require an enormous amount of effort, so it was left as a matter for future development projects. Therefore, the development of the costing practices was not viewed as a single project, with certain starting and ending points, but rather as a process that would also continue after this formal redesign project had finished. The scope of the system could be quite easily broadened into indirect manufacturing costs, and some actual cost allocations (e.g., rent, electricity, supervision of work, etc.) from cost centers to product variants could be considered in the future. Ultimately, there was clearly some potential in increasing the share of costs that were traced or assigned to products or other cost objects in the long-term.

5.4. Implications for pricing practices and the perceptions of performance

Since the process of utilizing the product cost information in FinnMechanics has only just begun, it is probably too early to make any final conclusions with regard to the performance and implications of the redesigned product costing system. However, it can be argued, that if the development had ceased with the introduction of new operation standards, the established practices would not have made much difference from the pricing perspective. Sales representatives had been accustomed to working with the sales configurator and price models, which made it hard to benefit from the cost information that could be obtained only by simulating product variants in the ERP system. Therefore, it was perceived as highly important that the sales configurator could also approximate the product costs without the access to the ERP system. As pointed out earlier, the current version of the sales configurator was only capable of presenting prices for product variants without any indication of production costs. Since the established time functions were fairly complex, further reductions were necessary in order to keep the sales configurator sufficiently flexible. Therefore, the accuracy of product cost information was reduced in order to make it accessible to all sales representatives, regardless of time and location. In practice, many minor work operations were combined and jointly approximated, while the most important operations were still modeled exactly as in the ERP system. The costs were divided into material and labor costs, which were further separated into the structural entities of the products. As a result, the sales configurator was capable of producing separate cost estimates for the basic frame of the product, as well as for different options that were selected. As soon as the sales configurator was capable of producing itemized cost estimates, it was possible to reflect on the pricing decisions and additional discounts using this as a reference point.

Although the mere presentation of reliable and itemized cost estimates during the pricing process could have improved pricing decisions, the sales managers also wanted to renew the actual price models. FinnMechanics could have decided to retain the existing models and simply present the improved cost estimates in addition, but everybody appeared to be eager to also revise the price models to give them greater transparency and harmony. This was also the point at which the sales managers really became involved with the project and the product cost information. They wanted to base the price models (ideologically) on the cost information, since that would give them a clearly identifiable basic logic that was the same from one product to another. This was perceived as important, since it would increase the transparency of pricing, both with regard to the company executives and the customers. Therefore, the new price models were built on top of the itemized product cost information by utilizing various contribution margin requirements. First, the basic frame structures were priced by setting product-specific contribution margin requirements for labor and materials. The distinction between the labor and material costs (and related contribution margin requirements) was perceived as important, since the company wanted to ensure that it could generate a sufficient contribution to the work that was performed in-house. Therefore, the required contribution margin for materials could be more easily bargained (e.g., in the instance of expensive special components) than the required contribution to labor. It was also perceived as important that the contribution margin requirements were product-specific, since this enabled consideration of the differences in general price levels between the products. Flexible use of these contribution margin requirements made it possible to establish unique price levels for each product, while simultaneously harmonizing the prices of different product variants.

After the rules for generating prices for the basic steel structures had been agreed, there was also a need for similar rules to govern the pricing of various options and accessories. Since many customers had earlier found it unfair that, for instance, the price of a specific actuator (i.e., a component) could vary significantly on the basis of the product for which it had been selected, the company wanted to provide them with prices that were independent of the products (naturally many options could still only be selected for certain products). Some options were priced in a similar manner to steel structures, by utilizing the contribution margin requirements for labor and material needed, while accessories and actuators were priced using separate price lists. Since the purchase prices of different actuators and accessories could vary from €5 to €1000, any fixed contribution margin requirements would not give appropriate prices for them all. Therefore, it was more convenient to give a separately determined price for each actuator and accessory and update these prices as required. As a result, the sales configurator was capable of producing separate prices for the basic steel structures, various configuration options and accessories/actuators, which could then be further totaled to give standard net price suggestions for the specific product variants. However, sales managers still wanted to retain the discounting policies that had helped in customer price differentiation, so processes to generate gross prices and grant discounts were also required. Although the standard discounts previously varied considerably from one product to another (i.e., there was no fixed relationship between the price suggested by the price model and the price that was actually obtainable from the markets), the company now wanted to also give this process greater transparency and harmony. The product-specific contribution margin requirements were selected in such a manner that the net price suggestions already reflected the real "average" price levels of products. The gross prices were simply formulated by scaling the net prices by applying the constant scaling factor (400%), which could then be cancelled out by granting a corresponding discount (75%). The basic structure and functioning of the price models is illustrated in Figure 24.

1 Itemized cost estimates on the basis of simplified costing models

Cost estimates for frame structures

Subassembly	Labor	Material
Assembly 1	€ 40,5	€ 140,4
Assembly 2	€ 10,5	€ 12,6
Assembly 3	€ 5,3	€10,4

Cost estimates for options

Option	Labor	Material
Option 1	x	x
Option 2	x	x
Option 3	x	x

Cost estimates for accessories

Accessory	Labor	Material
Accessory 1	x	x
Accessory 2	x	x
Accessory 3	x	x

2 Formulation of standard net prices on the basis of contribution margin requirements and price lists

Contribution margin requirements for frame structures

Product	Labor	Material
Product 1	60%	40%
Product 2	60%	30%
Product 3	50%	35%

Contribution margin requirements for options

Option	Labor	Material
Option 1	70%	40%
Option 2	40%	20%
Option 3	30%	30%

Separate price lists for accessories

Accessory	Price
Accessory 1	€ 100
Accessory 2	€ 530
Accessory 3	€ 65

Net price suggestions

3 Scaling to gross price level and granted discounts (i.e. price differentiation)

Scaling factors for the formulation of gross prices

Product	Scaling factor
Product 1	400%
Product 2	400%
Product 3	400%

Discount profiles for customer groups

Customer	Product 1	Product 2	Product 3
Group 1	75%	75%	75%
Group 2	71%	75%	73%
Group 3	77%	65%	70%

Final prices paid by the customers

Figure 24. *Functioning of the price models and formulation of gross/net prices.*

It is premature to assess the final impact of the established pricing models, but they have at least now been implemented into the sales configurator and are used to generate price lists and assist in project pricing. Therefore, the cost information is used for its originally intended purpose. It is simultaneously notable that the primary criterion for the selection of contribution margin requirements for the products was “minimal changes to the current prices”. The new pricing rules were generated so that, on average, the prices were not increased or decreased, and also that the relative prices of different product variants remained fairly constant. This means that although the improved understanding of product costs now forms the basis for all pricing decisions, it did not actually have any major impact on the prices that are charged to the customers. Only the pricing of certain options was radically changed on the basis of the produced cost information. Sales managers argued that the change in the logic of pricing must first be introduced to customers before any major changes in final prices can be implemented. Given the long-term customer relationships and pricing strategy focusing on price stability, the company did not want to give the impression that it tried to pass through price increases by concealing them under the cover of a change in pricing logic. After the customers become used to the functioning of new price models, it will be easier to also make more radical changes to prices that are charged. Whether or not, this will actually be carried out, remains to be seen.

Although only some pricing decisions were actually directly affected by the cost information, the sales managers appeared to be quite content with the situation. They naturally stressed the importance of knowing the cost differences between the product variants, but it appeared that the increased transparency of the pricing process was even more valuable from their perspective. It was simply important that the sales configurator was now capable of providing some approximated reference points (i.e., material and labor costs, and standard net prices) by which to measure the pricing decisions. This enabled the learning of pricing and prices, since, for instance, the way in which additional discounts affected the relative profitability of products and product variants became more apparent. The projects that primarily consisted of large and complex product variants had plenty of room to maneuver (i.e., it was possible to give significant additional discounts without sacrificing profitability), while it was simultaneously crucial to defend the prices for small and simple product variants. It was also important for the proposed gross prices to clearly have certain fixed relationships, both to standard net prices and to product costs. This made the pricing and discounting processes more transparent and enabled the establishment of some guiding rules with regard to the discounts that were permitted under specific circumstances. Moreover, the structure of the price models makes it possible to also use them in project pricing. Since the most important changes to product structures commonly fall on specific components and accessories that are handled separately in the price models, it should be possible to also value non-standard projects by simply making a few modifications to cost structures. This would still require some further development of the sales configurator, but at least the potential has been recognized by the company.

When it comes to perceptions of costing system performance, also considerably different viewpoints were presented by the members of the project team. For example, the SAP R/3 system specialist, who was heavily involved in the execution of the project, clearly associated the sophistication of the system with complex time functions, which were nevertheless quite easy to implement, maintain and update. Since the focus of modeling was on the production processes instead of products, it was easy to update them by changing only a few central parameters. If a new product is introduced, many existing operations can be directly assigned to it without any further specifications (e.g., the time function of the sheet-metal cutting operation is also capable of handling new products). In a similar manner, if a new cutting machine is purchased, it is only necessary to update the relative cutting speeds for different materials and to ensure that the standards will still accumulate the costs that are actually incurred. The business controller of the company was also satisfied with the improved accuracy of the established system, but simultaneously emphasized the value of the redesign process as such. As he once explained, the process had been a valuable learning experience and it had clearly brought the cost side of the business back to “coffee table discussions”. The project sent a message through the organization, and also shifted the focus to the cost and profitability implications of the decisions. As a result, the value of the cost system redesign project might have been equally related to a change in the institutionalized way of thinking as to the established formal system as such. It remains notable that although, for instance, production managers were involved in the determination of operation standards, the use of cost information has not so far expanded into new decision-making areas. It is not used for any kind of control purposes, although it has been planned that the same time functions are to be used in scheduling production in the future.

6. Discussion of findings

6.1. Cost system design choices and performance of product costing systems

6.1.1. Sophistication gap of established product costing systems

The empirical analysis of cost system design principles begins here with a small cross-case comparison of established product costing systems. In this brief exercise, the operational environments of case companies and characteristics of established costing systems are examined from the viewpoint of existing contingency studies and current conceptualization of cost system sophistication. Since this compactly recapitulates the characteristics of studied operational environments in terms of commonly identified contingency variables, it might also provide some preliminary ideas as to areas in which the data might have the potential to provide new insights for current knowledge. For example, since all the identified contingency studies have hypothesized a positive relationship between product diversity and number of cost pools/cost drivers (e.g. Al-Omiri & Drury 2007), case studies from companies with high product diversity, but low number of cost drivers, might have some potential to improve the current understanding of factors affecting appropriate cost system design. By far the most important contingency variables that are associated with cost system design choices are product diversity, cost structure, size of the organization, level of competition and degree of customization. Each of these variables was used at least in four out of eight identified contingency based surveys (i.e. Bjørnenak 1997, Gosselin 1997, Krumwiede 1998, Clarke et al. 1999, Malmi 1999, Hoque 2000, Drury & Tayles 2005, Al-Omiri & Drury 2007). The importance of cost information and quality of information technology was examined in two of these studies, while other variables were either used only in a single study (e.g. the extent of automation used by Hoque 2000) or operationalized in manner that made them essentially separate variables (e.g., strategy as measured through dichotomies of cost leadership/product differentiation versus prospector/defender). Table 11presents summaries of studied operational environments in relation to the most commonly researched contingency variables. Since all the studies essentially hypothesized a similar relationship between these contingency factors and cost system sophistication, the “expected” relative sophistication of established costing systems is also stated. This might provide some interesting ideas, although it is similarly worth mentioning that none of the studies truly suggest that any two costing systems could be compared in this manner.

Table 11. *Comparison of case companies through important contingency variables.*

Contingency variable	Studies that have examined the contingency variable in question	Expected relationship between the contingency variable and cost system sophistication	Description of the operational environment in FinnBakery	Description of the operational environment in FinnMechanics	Expected (relative) sophistication of the product costing systems
Product diversity	Bjømenak (1997) Krumwiede (1998) Clarke et al. (1999) Malmi (1999) Drury & Tayles (2005) Al-Omiri & Drury (2007)	There is a positive association between higher levels of product diversity and the level of cost system sophistication (Al-Omiri & Drury, 2007).	Number of products is moderate and their production processes are highly similar. As a result, resource consumption patterns among the products are fairly similar.	Number of products is rather low, but differences among them are much more significant than in FinnBakery. Also the resource consumption patterns among the product variants are significant due to the configurability.	**FinnMechanics** would be expected to operate more sophisticated product costing system.
Cost structure	Bjømenak (1997) Clarke et al. (1999) Malmi (1999) Drury & Tayles (2005) Al-Omiri & Drury (2007)	There is a positive association with the proportion of indirect costs within an organization's cost structure and the level of cost system sophistication (Al-Omiri & Drury, 2007).	Shares of direct material and labor costs are around 30% and 20% respectively. There are also some other costs that are clearly direct to products (e.g. different marketing fees, allowances etc. might add up to 10%)	Share of direct material costs is clearly higher (around 55%) but the share of direct labor costs is considerably smaller (around 10%). The share of manufacturing overheads is slightly smaller.	Both companies would be expected to operate somewhat equally sophisticated product costing systems.
Size	Krumwiede (1998) Clarke et al. (1999) Malmi (1999) Drury & Tayles (2005) Al-Omiri & Drury (2007)	There is a positive relationship between the size of the organization and the level of cost system sophistication (Al-Omiri & Drury, 2007).	Size is commonly measured through turnover (€20 millions) or employees (around 140), which both would rank the company as rather small.	Both turnover (€30 millions) and number of employees (around 200) convey an image of slightly bigger company. FinnMechanics also belongs to considerable bigger international group.	**FinnMechanics** would be expected to operate more sophisticated product costing system.
Level of competition	Bjømenak (1997) Malmi (1999) Drury & Tayles (2005) Al-Omiri & Drury (2007)	There is a positive association between the intensity of competition and the level of cost system sophistication (Al-Omiri & Drury, 2007).	There is around ten main competitors and hundreds of smaller players. Competition is almost solely domestic and the number of competitors has remained constant.	There is from 2 to 5 main competitors in each product category and around 10 to 15 in total. Competition is truly international and new small competitors emerge constantly from low-cost countries.	No basis to claim the expected relative sophistication of product costing systems.
Degree of customization	Bjømenak (1997) Krumwiede (1998) Malmi (1999) Drury & Tayles (2005)	The greater the degree of customization, the lower the level of complexity of the costing system (Drury & Tayles, 2005).	Company operates with standardized products which are not customized. Batch production with rather high batch-sizes.	Mass customized products with multiple configuration options. Products are also occasionally tailored to meet the specific customer requirements (ETO).	**FinnBakery** would be expected to operate more sophisticated product costing system.
Importance of cost information	Drury & Tayles (2005) Al-Omiri & Drury (2007)	There is a positive relationship between the importance of cost information and the level of cost system sophistication (Al-Omiri & Drury, 2007).	Low profit margins which highlight the need for accurate product cost information. Capacity constraints that require to rank the products for product mix decisions.	High profit margins but considerable variation among the product variants, orders and customers.	No basis to claim the expected relative sophistication of product costing systems.
Quality of information technology	Krumwiede (1998) Al-Omiri & Drury (2007)	There is a positive relationship between the quality of an organization's information technology and the level of cost system sophistication (Al-Omiri & Drury, 2007).	Many partly outdated stand-alone (i.e. not integrated) IT-systems. Simplistic ERP-system. Constant problems with data gathering.	SAP R/3 ERP-system with all the important modules implemented. Business intelligence program etc.	**FinnMechanics** would be expected to operate more sophisticated product costing system.

As indicated in Table 11, only one of the commonly used contingency variables (i.e., degree of customization) provides a reason for expecting that FinnBakery would operate with a more sophisticated product costing system than FinnMechanics. While customized products result in non-repetitive activities for which standards are hard to set, the operation of sophisticated costing system needs constant tracking of actual costs, which increases the cost of operating such a costing system (Drury & Tayles 2005). As a result, the sophistication of a product costing system is expected to decrease in relation to an increasing degree of customization, since more costly investments in additional sophistication are harder to justify on the cost-benefit basis. On the contrary, at least three contingency variables (i.e., size, product diversity, and quality of information technology) clearly suggest that FinnMechanics could be expected to operate a more sophisticated product costing system (see Drury & Tayles 2005 for justification of hypothesized relationships). The three remaining contingency variables (i.e., cost structure, level of competition, and importance of cost information) cannot be used to hypothesize the expected relative sophistication of established product costing systems. This is either because the companies are fairly similar in these respects (i.e., cost structure) or the specific operationalization of variables (i.e., importance of cost information and level of competition) affects the expected relative sophistication. For example, Malmi (1999) measured the level of competition by proportion of exports in turnover, while Bjørnenak (1997) used number of competitors to measure this construct. Since FinnBakery clearly has a high number of competitors, but only a minor share of exports in turnover (and FinnMechanics is the other way around), these alternative operationalizations would lead to the opposite hypothesis with regard to the expected relative sophistication of established costing systems. Therefore, there is no basis to form any expectations on the basis of these variables. When considered together, it appears reasonable to conclude that FinnMechanics could be expected to gain greater benefit from operating sophisticated product costing system. This should also be reflected in cost system redesign projects.

When analyzed in the light of commonly used proxies for cost system sophistication (i.e., number/nature of cost pools and number/nature of cost allocation bases), it is notable that the product costing system operated by FinnBakery would be ranked higher in every aspect. Although FinnMechanics uses only standard material and labor overhead rates to allocate some of the manufacturing overheads to products, FinnBakery allocates both manufacturing and administration overheads to products by using different types of cost pools and cost allocation bases. FinnMechanics uses only standard material and labor overhead rates to allocate some of the manufacturing overheads to products, while FinnBakery allocates both manufacturing and administration overheads to products by using different types of cost pools and cost allocation bases. When compared to the number of cost pools and cost drivers that companies are reported to commonly use, the product costing system in FinnBakery would be regarded as fairly sophisticated, having over 20 cost pools and 10 different cost allocation bases. Brierley (2008), for instance, reported that the median number of cost pools is seven, while the median number of cost drivers is only one. Studies by Drury and Tayles (2005) and Al-Omiri and Drury (2007) excluded the companies using direct costing systems from their data set, and consequently reported somewhat higher median numbers of cost pools (11-20 in both studies) and cost allocation bases (two and four, respectively). The product costing system of FinnBakery would be ranked as above average in sophistication, while the product costing system of FinnMechanics would be deemed as unsophisticated, with regard to all these median numbers. This is quite an interesting finding when considered in the light of the previously listed contingency variables and their commonly expected relationships to cost system sophistication. It is also notable that the company representatives had just decided to establish these costing systems, and they all seemed fairly satisfied with the results. Therefore, there was no apparent “lack of fit” between the operational environments and the choices of cost system design. The selection approach to fit could not even consider such an option, since the basic assumption is that the only companies that exist are those with appropriate costing systems (Gerdin & Greve 2008).

The case evidence shows that FinnMechanics chose to design and operate a costing system without any complex procedures to allocate indirect costs, while FinnBakery perceived these allocations as beneficial and acted accordingly. Although the opposite results could have been hypothesized on the basis of the existing contingency-based literature (i.e., the literature suggests that there is a poor fit between operational environment and structure of costing system), the representatives of both companies appeared to be satisfied with the performance of their systems. People also perceived their systems to be fairly sophisticated, which was also the intuitive conception of the researchers.

In the case of FinnMechanics, the sophistication was not simply related to the methods used to handle indirect costs, but rather to practices used to assign direct labor costs to various product variants. The performance of the costing system was also related to these practices, and indirect cost allocations did not appear to be of any great significance. These observations provide a starting point for the more profound analysis of cost system design principles and their relationship with costing system performance. The analysis unfolds in the following manner: Chapter 6.1.2 critically examines the claim of more accurate indirect cost allocation, showing that the accuracy of product costing system is always (at least) partly dependent on the extent of direct cost tracing; Chapter 6.1.3 further analyzes this issue, focusing more directly on the operationalization of sophistication through the number/nature of cost pools and cost drivers. It is shown that even if direct cost tracing were as trouble-free as is described in the literature, the number/nature of cost pools and cost drivers may not reflect accuracy, which it had been the intention to capture; Chapter 6.1.4 extents the analysis by asking whether the allocations to products are somehow preferable in the first place, and whether the performance of product costing systems can be judged without paying attention to the wider structure of such systems. Together these chapters address the problems related to sophistication as part of typical contingency studies (i.e., is it reasonable to expect that the measures used reflect the accuracy of product costing systems); Chapter 6.1.5 then focuses on the more general issue relating to the assumed relationship between the performance of the costing system and accuracy of cost information. This provides information regarding the question of whether the current discussion around cost system design choices and sophistication provides sufficient understanding of the factors that affect the performance of product costing systems; finally, Chapter 6.1.6 discusses the implications of these findings for cost system design and contingency-based accounting research.

6.1.2. Exclusive focus on indirect cost allocation methods

The discussion around cost system design principles in general and cost system sophistication in particular has been almost exclusively focused on the allocation of indirect costs (e.g. Abernethy et al. 2001, Drury & Tayles 2005). The common assumption seems to be that “Because both direct material and direct labor are traceable to the product, the association of their costs with a product is fairly obvious and the assignment of their costs to the product does not cause problems” (Lere 2001). Therefore, all the costing systems are held to be equally capable of accurately tracing direct costs to products, so the only differences lie in the methods used to allocate indirect costs (e.g. Drury & Tayles 2005, Al-Omiri & Drury 2007). However, some interesting case findings appear to pose a challenge to this common assertion. First, both of the case companies clearly had difficulties in distinguishing between direct and indirect costs and they simply adopted a stance such that certain cost elements were categorically either direct (i.e., materials used for products and shop floor labor) or indirect (i.e., basically all remaining production and administration costs). Second, given this conceptualization of direct and indirect costs, both companies actually first wanted to renew the practices that were used to handle what they called the “direct costs” of products. While FinnBakery did not show considerable interest toward the indirect cost allocation methods before the direct cost assignment was perceived as reliable, almost the entire costing project in FinnMechanics was purposefully aimed at more accurate direct cost estimation. Third, the reshaping of direct cost assignment practices led to above +100% adjustments to direct product costs in both companies in the most extreme cases. Although there may be no basis for arguing that new figures were accurate and old figures were distorted, the mere existence of differences raised some questions regarding the assumption of trouble-free direct cost assignment. In fact, the evidence seems to suggest that the case companies either misclassified some of their indirect costs as direct, or direct cost assignment is not really as problem-free as is commonly suggested.

Beginning with the classification hypothesis, the distinction between direct and indirect costs refers quite explicitly to the relationship between the cost and the cost object (Drury 2004). The key notion is “traceability”, which generally speaking refers to the ability to chronologically interrelate unique identifiable entities in a way that is verifiable. In the realm of product costing systems, this is usually interpreted such that costs that can be specifically or physically associated with the products are direct, while those that cannot are indirect (Hansen & Mowen 2006). If this basic principle is strictly followed, there are actually some indirect costs that were “misclassified” as direct by both of the companies. For example, the labor costs included in routings/recipes were always referred to as “direct costs”, although they clearly involved some indirect costs that were considered in standard operation times in order to simplify the costing system. This type of categorical classification also still appears to be quite common among academics, and sometimes the material and labor costs of production are simply referred to as direct costs (e.g. Brierley 2008). Therefore, the conceptualization of cost as direct appears not to require a strict causal relationship between the cost and the cost object; rather, the question concerns the relative strength of such a relationship. However, not all the problems with direct cost assignment arose from inappropriate classification. For example, the labor costs related to the night shifts in FinnBakery could easily have been associated with the production of certain products. In a similar manner, almost all of the shop floor labor costs in FinnMechanics were genuinely direct in the sense that it was possible to register a time that was specifically used to produce a certain product variant. Some costs also appeared to be direct, but were not traced to products or product variants in the product costing system. This also appears to be evident more generally, while Brierley (2001) pointed out that sometimes the proportion of direct labor costs is so insignificant that they are included in overhead costs.

When the distinction between direct and indirect costs is examined more closely, it appears that it is not only practitioners who have problems in providing exact definitions for these cost concepts. The key issue causing confusion is whether the concept of traceability includes only the existence of a causal relationship between the cost and the cost object, or whether the economic feasibility of the assignment is also included (Hansen & Mowen 2006). Drury (2004), for instance, followed the strict definition of indirect costs by conceptualizing them as those costs that cannot be traced directly to cost objects, since they are common to several such objects. This basic idea of “jointness” is also one of the most important grounds for objection with regard to the practices of further allocating indirect costs to products (Baxter & Oxenfeldt 1961). Following this line of thought, costs are viewed as intrinsically direct or indirect in relation to products, which suggests that indirect costs cannot even in principle be traced to them. It remains important to notice that use of some stock materials to produce product actually “leads” the replacement of these materials, and not the purchase that has already taken place in the past (Baxter & Oxenfeldt 1961). Conversely, Horngren et al. (2012) defined indirect costs as those that cannot be traced to a particular cost object in a “cost-effective way”. On the basis of this definition, the indirectness is not incorporated solely into the relationship between the cost and the cost object, but also depends, for instance, on the level of information systems. Following this line of thought, the distinction between direct and indirect costs becomes a relative issue, which is essentially based on judgment, and not on the intrinsic relationship between the cost and the cost object. FinnMechanics could have traced the costs of finishing operations (e.g., galvanizations, painting, etc.,) to product variants, but it was not considered to be an appropriate solution. While Horngren (2012) would conceptualize these costs as indirect, Drury (2004) specifically points out that sometimes direct costs are treated as if they would be indirect.

The exact definition of direct and indirect costs was not particularly a practical concern in either of case companies. It is neither very important here, since both stances basically led to the same conclusions regarding the design choices affecting the accuracy of costing systems. If the strict definition of indirect costs is adopted (i.e., these are costs that cannot be traced to products), then the entire notion of accurate indirect cost allocation methods becomes meaningless (Armstrong 2002). If the indirect costs simply do not have any causal relationship to products, it would be misguiding to discuss the inaccuracy of cost allocations, since this would suggest the existence of a reference point to which a comparison would be possible. The only basis for claiming that one indirect cost allocation method is more accurate than another is the concession that some of the indirect costs are actually truly direct (Armstrong 2002). The logical conclusion would then be that the accuracy of the product costing system actually depends on the extent of direct cost tracing instead of indirect cost allocations. Conversely, the more relativistic view, whereby the indirectness is based on the actual treatment of costs in a particular costing system, also essentially leads to the same conclusion. In this instance, there are more and less accurate cost allocation bases (which justify the claims of accurate indirect cost allocations), but the possibility of handling these costs as direct simultaneously exists. Therefore, companies would have the option to “transform” some of the indirect costs to direct costs by, for instance, investing in information systems (Brierley 2008). Although FinnMechanics could pool all the external finishing costs into a single cost pool and use the material costs as an allocation base, it could alternatively invest in procedures that directly trace these costs to product variants. The logical conclusion, i.e., that the accuracy of the product costing system is (at least partly) dependent on the extent of direct costs tracing, would remain.

On the basis of this discussion and observations from the case companies, there appears to be at least three different categories of “indirect costs” that are handled in product costing systems. First, there are costs that are indirect in the sense that they cannot be assigned, even in principle, to products, because they are common to multiple products (Drury 2004). In this category, the accuracy of allocations cannot be held as any kind of criteria by which to judge the degree to which the cost system design is appropriate (Armstrong 2002). The allocation is always arbitrary, so the selection of cost allocation bases must be made on the basis of some other criteria (Hansen & Mowen 2006). Second, there are costs that could be assigned to products on the basis of somewhat causal relationships, but this is not done, because these relationships are not identified or the actual tracing would incur significant costs. It seems plausible that the claims of more accurate indirect cost allocation (e.g. Jeans & Morrow 1989) refer to the existence of this indirect cost category, since there are actually more, and less accurate, cost allocation bases. It would be more accurate to allocate finishing costs (in FinnMechanics) to products based on size, rather than on labor costs, since size correlates better with the weight that is the actual billing basis for these operations. However, there is also the possibility of directly tracing these costs to products (Brierley 2008), which leads to the conclusion that accuracy is partially dependent on the extent of direct cost tracing. Third, there are costs that could be directly traced to single products, but which are regarded rather as belonging to the entire production. The mere fact that the amount of time used to produce a certain product can be physically observed does not mean that there is necessarily a causal relationship between the used time and the produced product (Piper & Walley 1990). For example, FinnBakery allocated, rather than traced, the extra labor costs of night shifts to products, since this was perceived to better reflect the reasons why these costs occurred in the first place. In this cost category, the notion of accuracy depends very much on the definition that is adopted. It still appears that even the claim that “The more costs that can be traced to the object, the greater the accuracy of the cost assignment” (Hansen & Mowen 2006) can be challenged. Conversely, the entire concept of causality between current decisions and historical outlay expenses can be questioned (Baxter & Oxenfeldt 1961, Piper & Walley 1990). If avoidable costs are regarded as a reference point, essentially all products should be valued by using the cost of night hours, since the dropping of any product would lead to their decrease.

The assumption that the assignment of direct costs is unproblematic is essentially the foundation on which the conceptualization of sophistication exclusively through indirect cost allocation methods is based (Al-Omiri & Drury 2007). This assertion holds only in the sense that, in principle, all costing systems might have equal capabilities of tracing direct costs to products. It still does not mean that all the costing systems trace all direct costs to products, or that the method of tracing would not be prone to many errors. It is important to understand that while some companies may decide to build complex allocation methods, others may invest in an information system that enables cost tracing (Brierley 2008). The notions of direct and indirect costs are rather used as relative concepts that deal with reasonableness and logic of the cost assignment methods, than strictly to describe the costs that have a clear and observable causal relationship to a particular cost object. Moreover, essentially all the distortions related to indirect cost allocations (see Figure 9) are likely also relevant in the case of direct tracing (Labro & Vanhoucke 2007). If the measurement error on a resource cost pool stems from an accountant who misclassifies certain marketing cost as administration costs, a shop floor worker may equally well improperly register work on the wrong time sheet or product (i.e., a measurement error on direct tracing?). Of even greater importance, this registration might include various assisting tasks that are not directly related to the product at hand, but rather to the production in general (i.e., an aggregation error on direct tracing?). The worker may, for example, spend considerable time in searching for a part that has been lent to another product, which raises the question as to what actually caused the cost to occur (Piper & Walley 1990). This was partly the reason why FinnMechanics did not want to establish a product costing system based on actual time registrations. This type of costing system would have been burdensome to operate and still prone to considerable errors. The important factor is that companies make different choices regarding their direct cost assignment, and these choices are not always unproblematic in their nature.

The previous discussion clearly shows that the accuracy of cost information is inevitable partly related to the extent of direct cost tracing. Since some companies might invest in complex information systems that enable direct tracing (Brierley 2008), it is reasonable to expect that these design choices ultimately also affect the performance of product costing systems. For example, some of the benefits obtained in FinnBakery derived from the fact that some previously indirect costs were transformed into direct costs through specific investments in information systems and meters (e.g., installation of electricity meters). Direct tracing is also not as trouble-free as has been commonly assumed in literature (Lere 2001). Both case companies made specific cost system design choices relating to handling of direct costs, and these choices affected the perceived usefulness of the systems. In fact, performance of product costing systems in FinnMechanics was primarily related to the flexible use of time functions that were used to assign direct labor costs to product variants. As a result, the appropriate design of a product costing system may not be understood without paying attention to the methods used to handle direct costs. Therefore, the concept of cost system sophistication should not be restricted to indirect cost allocations methods, especially when used to refer more generally to the design choices that (positively) affect the performance of product costing systems (Brierley 2008). As a specific construct, it may naturally still refer only to indirect cost allocation methods, but it is important to notice that if the methods used to handle direct costs partly determine the performance of costing systems, it might not be reasonable to expect finding any persisting relationship between sophistication and different contingency variables. If the purpose is really to understand the factors that determine whether a costing system is perceived as useful, a focus on the system as whole, and not only a part of it, is necessary. This view was supported by Brierley (2008) who stated that the role of overhead allocation methods might be overstated in the literature, and that there is a need to give greater consideration to the measurement of direct costs.

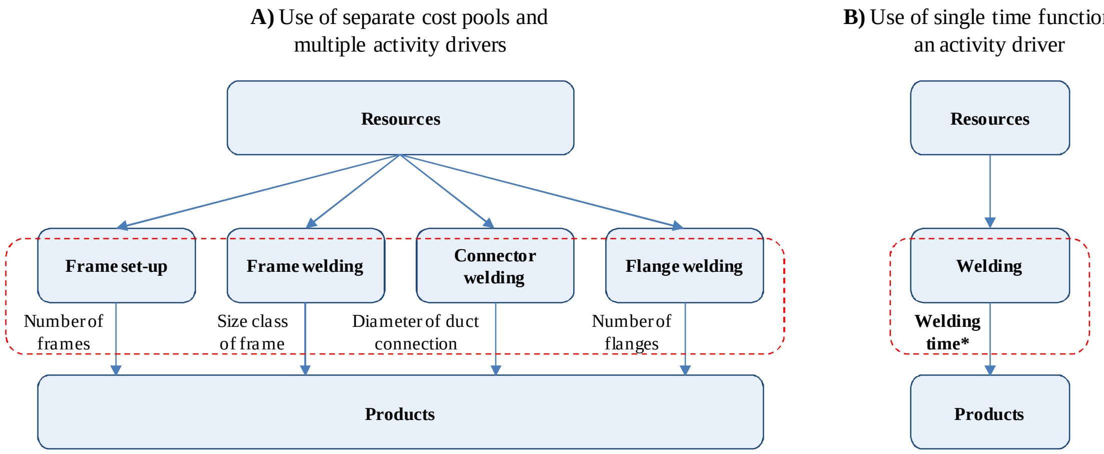
6.1.3. Capacity of cost pools and cost drivers to reflect accuracy of cost allocations

In the previous chapter, it was pointed out that the accuracy of a product costing system cannot be ultimately evaluated without paying attention to the extent of direct cost tracing. However, the issue of indirect cost allocations remains relevant, and a considerable amount of literature highlights the impact that more accurate indirect cost allocation methods may have on organizational performance (e.g. Cooper & Kaplan 1988b, Kaplan 1988). The literature suggests that the accuracy of indirect cost allocation is determined by number of cost pools, nature of cost pools, number of different types of cost drivers (e.g., labor hours, machine hours, material movements, etc.), nature of cost allocation bases (e.g., volume-based versus hierarchical drivers), type of cost allocation bases (e.g., transaction versus intensity drivers) and the extent of reliance on direct charging in the first stage of the allocation process (Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). Although considerable attention has been given to all these issues, the impact of cost allocation bases and cost pools on accuracy has been especially examined (Datar & Gupta 1994, Labro & Vanhoucke 2007). The number of cost pools and cost drivers are also used as proxy measures for sophistication in all recent contingency-based studies of product costing systems (e.g. Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). The rationale for selection is that by disaggregating the indirect costs into higher number of cost pools, and by using a greater number of cost allocation bases, it should be possible to assign a higher share of indirect costs, based on the causal relationships (Datar & Gupta 1994). As a result, the sophistication should reflect the system's ability to provide accurate product cost figures, which should provide considerable benefits under specific circumstances. It remains questionable as to whether, and to what extent, these measures truly reflect the accuracy of indirect cost allocations (Armstrong 2002).

The idea of causality appears to be embedded in the basic assertion of ABC, which states that activities cause costs and products consume activities (Gunasekaran 1999). This has been used to legitimize the claims that cost assignment based on activities and their outputs will lead to more accurate product cost estimates and enhanced decision-making (Jeans & Morrow 1989). Lebas (1999) probably went furthest in this notion by proposing that ABC should actually be the acronym for 'accounting based on causality'. However, if the idea that a causal relationship between the cost and the cost object is the basis on which the accuracy is reflected is already questionable in the case of direct costs, it is an even more far-fetched idea when considering indirect costs. For example, Armstrong (2002) showed how typical application of ABC pools all types of costs together and use the outputs of standard activities to further allocate these costs to products and other cost objects. In this process, all the costs of purchasing function may become allocated to products on the basis of the number of purchase orders, although the very act of placing these orders is likely to constitute only a minor share of the associated costs. This problem was clearly visible in FinnBakery, and it is debatable whether the resulting allocations are accurate or reflect the relationship between the cost and the cost object (although they might be perceived as such). A further problem is that while additional cost pools and cost drivers may decrease certain kind of distortions, they may simultaneously cause offsetting distortions elsewhere in the costing system (Datar & Gupta 1994). On the basis of these problems, Piper and Whalley (1990) straightforwardly stated that the basic assertion of ABC, i.e., that activities cause costs, is nothing more than a lucrative fallacy. The authors argued that there is no reason to believe that the activities represent ultimate reasons for costs and it could equally well be stated that the cause for the costs lies in decisions, time, or volume. It is also questionable as to whether there is any single reason or cause for any effect in the first place. John Stuart Mill (1969) stated that the idea that an event or outcome has one specific cause is simply a logical fiction that people use in everyday conversation. Regardless, it appears clear that the causality between forthcoming products and historical costs that have already been incurred cannot truly be the basis on which the accuracy of costing systems could be founded.

Some more practical concerns also arise from the attempts to use the number and nature of cost drivers and cost pools as proxy measures for accuracy and sophistication. This is especially true when the purpose is to understand appropriate cost system design choices based on these results that are obtained. As Reinstein and Bayou (1997) pointed out, the concept of product cost varies from the inclusion of only direct material costs to the inclusion of all the costs that a company incurs. Therefore, companies may choose to allocate only indirect manufacturing costs to products or to also include administration overheads (Drury & Tayles 1994). This means that it is debatable as to whether different product costing systems can be meaningfully compared in terms of cost pools and cost drivers, without paying attention to the costs that are actually allocated to products through this kind of mechanism. Some companies may use 10 cost pools and five cost drivers to allocate indirect manufacturing costs to products, while others may use exactly the same number of cost pools and cost drivers to allocate all indirect costs to products. Given that these systems have very different scopes in terms of included costs, the number of cost pools and cost drivers are unlikely comparable. This is also more generally the basic problem of contingency studies that attempt to describe the complex nature of product costing systems through a linear continuum that attempts to capture the alleged accuracy of the system (c.f. Abernethy et al. 2001). Simply, so many cost system design choices affect the accuracy of costing systems that one-dimensional models may never be capable of providing consistent results. It is also quite easy to significantly increase both the number of cost pools and number of cost drivers without achieving a corresponding increase in accuracy (Datar & Gupta 1994). FinnBakery more than doubled both the number of cost pools and cost drivers simply by treating the different delivery routes as separate cost pools with various cost drivers. However, since the majority of products are delivered quite evenly through different delivery routes, the corresponding increase in accuracy was likely minor. If the same number of cost pools and cost drivers had been added by splitting the existing departmental cost pools into two (and adding appropriate cost drivers for these new cost pools), the impact on accuracy would have likely been much higher.

The problems related to number of cost pools and cost drivers as proxy measures for sophistication are not limited to their varying contribution to the accuracy of the costing systems. A further issue is related to the fact that the same effective outcome may be achieved by very different cost system design choices. This can be illustrated through the feature-based product costing approach that was used to model the production costs in FinnMechanics (see Duverlie & Castelain 1999, Qian & Ben-Arieh 2008 for similar approaches). Feature-based costing links different configuration options, and their impact on activities, by the application of complex parametric time functions. While FinnMechanics uses parametric time functions to handle direct labor costs, these same principles are easily applicable to any other functions and activities (Kaplan & Anderson 2004). The point is that the design choice of using complex time-functions to assign costs to products leads to a system that might be equally as accurate, but is deemed unsophisticated on the basis of all the common proxies. In the example of marketing costs, it would be possible to first allocate these costs into various cost pools representing the central activities (e.g., sales order handling) and then use the demand for their outputs (e.g., number of sales orders) to further assign the costs. In this instance, the costing system would include multiple cost pools and multiple cost allocation bases, depending on the number of activities. It would still be equally possible to establish a time function that comprises the time estimates of these multiple activities (e.g., the time required to handle a sales order = constant + x / number of products included). In this instance, there would be only single cost pool and single cost driver (i.e., time) if the definition of separate cost drivers given by Drury and Tayles (2005) is adopted. A simple illustration of this problem is given in Figure 25, which uses one of the established time functions in FinnMechanics as an example. Referring to the previous discussion, it is also notable that these costs could be traced to products by physically observing how much time each product variant actually consumed.



* **Welding time** $= A(5 + \pi HD_1v_1) + B(5 + \pi HD_2v_2) + Ck(8 + Hv_3l + 3p)$, where:

A,B,C = Number of duct connectors, flanges and frames respectively
v_1,v_2,v_3 = Welding speed of duct connectors, flanges and frames respectively
D_1, D_2 = Diameter of duct connectors and flanges respectively

l = Length of the welded edge
H = Grinding constant
k = Handling factor
P = Product specific constant

Figure 25. *Alternative configurations of functionally similar costing systems.*

As illustrated on the left hand side of Figure 25, the welding process could be divided into four different activities that each has separate cost drivers. The same outcome could essentially still be obtained by simply pooling all the welding costs into a single cost pool and using a time estimate for total welding time as a cost driver. This is basically the core idea of the time-driven activity-based costing that was introduced by Kaplan and Anderson (2004) to simplify a typical application of ABC systems. It is notable that, according to Drury and Tayles (2005), the time estimate would be calculated as a single cost driver, whereas the number of frames/flanges, diameter of duct connector and size of product, would represent separate cost drivers. However, although the time estimate is truly only a single activity driver (i.e., cost allocation base), it actually accounts for all the previously mentioned cost drivers (i.e., reasons for variation in costs). It is justifiable to ask whether the number of activity drivers is actually important, or whether the more correct basis for analyzing the costing system would be the extent to which various cost drivers are considered. Therefore, a system applying complex time-functions might be better able to accurately reflect variations in product costs, without using multiple cost pools and activity drivers. The way in which the exact number of different types of cost drivers should be calculated is also somewhat obscure. Given these issues, it appears that the number/nature of cost pools and cost drivers may not be very reliable proxies for the accuracy of product costing systems. Therefore, it is necessary to be highly cautious when assuming that the use of higher number of cost pools and cost drivers really does lead to more accurate cost allocations. Brierley (2008), for instance, did not find any relationship between the number of cost pools and cost drivers in a product costing system and managers' satisfaction with product cost accuracy. Despite these problems, the cost pools and cost drivers may remain the best proxies for large-scale surveys, and may also convey a somewhat truthful idea of the studied costing systems on average (Al-Omiri & Drury 2007). It remains important to bear in mind the fact that costing systems vary in their scope, and the absolute number of cost pools and cost drivers may not always reflect the system's capacity to provide accurate product cost figures.

6.1.4. Boarders of the product costing systems and multiplicity of cost objects

With regard to the discussion concerning the exact meaning of direct and indirect cost (c.f. chapter 6.1.2.), it must be noted that the distinction is always made in relation to certain cost object (Hansen & Mowen 2006). Costs are not intrinsically either direct or indirect, but may be classified as such depending on the point of reference. For example, delivery costs in FinnMechanics are usually direct to individual projects (i.e., delivery is ordered specifically for a single project), but not to individual product variants (i.e., delivery is common for multiple product variants). This implies the existence of considerable leeway regarding the classification of costs either as direct or indirect, and the issue is closely related to the selection of cost objects. Since the cost object might be any customer, product, service, contract, project, or any other work unit for which a separate measurement of costs is desired, all the costing systems essentially comprise a network of cost objects (Gunasekaran 1999). Therefore, there are always multiple cost objects (e.g., work centers, cost centers, departments, activities, etc.), which are rarely stand-alone entities, but which are related to one another in various ways. The cost objects may be, for instance, hierarchically related (i.e., product unit, product batch, product, product family, product line, factory, etc.), in which case the direct costs of lower level cost objects are also direct for those at higher levels (e.g., the direct costs of product units are also direct costs of product families). As a consequence, the assignment (or accumulation) of costs upwards in this cost object hierarchy is rather unproblematic. However, a cost allocation is always necessary in order to assign a direct cost of a higher-level cost object downwards in this same hierarchy. In accordance with this idea, some intermediate cost objects are usually employed to accumulate and allocate costs to final cost objects (Geiger & Ittner 1996). In particular, the role of activities as important cost objects in assigning costs to other cost objects has attained considerable attention during recent decades (Mevellec 2009). Some cost objects may also only structure the existing data and are not required for allocation purposes (e.g., they are only used to accumulate data for reporting purposes). Since the network of interrelationships among the various potential cost objects is likely to be highly complex in nature (e.g., different service departments may be internal customers for one another, resulting in complex cross-charges), the costing systems must always simplify both the structure of cost objects and their depicted relationships.

Since this discussion is primarily related to product costing systems, the ultimate cost object is allegedly a product. Furthermore, the vast majority of existing literature discussing cost system design principles is concerned with products/services as ultimate cost objects, which is only natural given their importance for any company (Gunasekaran 1999). In addition, the construct of sophistication is essentially related to the costs that are indirect in relation to products. For example, Drury and Tayles (2005) asked respondents to relate all their responses regarding cost pools and cost drivers to the most important cost object, and 81% of them selected products/services. This type of conceptualization conveys a view that cost allocations to products would be somehow preferable (e.g. Drury & Tayles 2005), although it could be equally well postulated that a sophisticated product costing system does not need to rely on cost allocations. Sharman (1998), for instance, stressed that the correct design of ABC do not force the allocation of activity costs to products, but assign them to cost objects that genuinely receive the output of the activity. Therefore, the optimum costing policy might be to assign only traceable direct costs to cost objects (Hansen &

Mowen 2006). Both of the case companies appeared to partly share this view, and the perceived logical association between the costs and products appeared to be a prerequisite for the cost allocations. FinnBakery allocated almost all the costs to products only because they believed that these costs at least correlated with the products, if they were not in reality caused by them (Miller & Vollmann 1985). Furthermore, FinnMechanics could have probably presented some estimates as to how different product families burdened overhead resources, but there would have been no reasonable basis for judging how to further assign these costs to product variants. Product variants were simply perceived to be unrelated to the level of overhead costs and the issue was rather that all the product variants had to cover these costs in total. As a result, the scope of the system was restricted to include only those manufacturing costs that were somewhat related to the product units, and it was perceived as more appropriate to trace other costs directly either to projects, customers, or market segments (although this was not eventually conducted during the project). The important issue is whether the performance of the costing system can be analyzed with a sole focus on the cost allocations to products, or whether the wider structure of cost objects and related design choices also affects this relationship. This question is further illustrated in Figure 26.

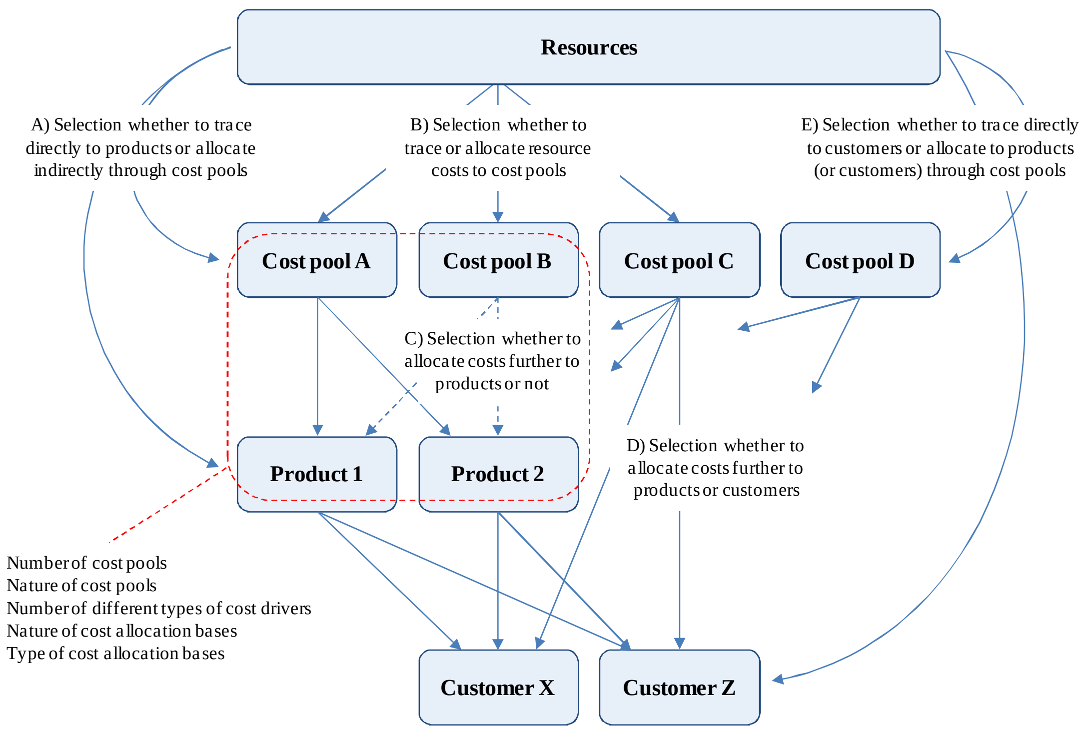


Figure 26. *A simplified cost object structure and some related assignment choices.*

Figure 26 depicts a highly simplified cost object structure with certain cost assignment choices, which can be used to further illustrate that the discussion of cost system design choices is commonly focused on a very limited aspect of costing systems (c.f. thin red dashed line). Companies may initially decide either to trace or allocate some costs to products (Brierley 2008), so cost system sophistication and accuracy are ultimately dependent on the extent of direct cost tracing (c.f. instance A). If the company decides to assign costs to products through cost pools, a similar decision as to whether to trace or allocate resource costs to these cost pools (c.f. instance B) must be made. The cost pools are simply other cost objects in the system (e.g., activities, departments, cost centers, work centers, delivery routes, etc.,) and the accuracy of second-stage allocation (i.e., from cost pools to products) is dependent on the extent of direct tracing in the first stage (Datar & Gupta 1994). For example, if cost pool A represents a production line in FinnBakery, energy costs can be assigned to this cost pool either by dividing the total amount of energy costs by the number of production lines (i.e., cost allocation) or by directly tracing using meters to measure the actual consumption of energy. If some production lines actually consume more energy than others, direct tracing clearly improves the accuracy of cost information at the level of production lines. It also simultaneously ensures that the correct total amount of energy costs is allocated to those products that use the particular production line, although accuracy at the product level is still largely dependent on to what degree the second-stage assignment is appropriate. The first stage of the allocation process is equally as important as the second stage and might actually already involve multiple stages of consecutive allocations (Horngren 2012). As a result, the design choices regarding first-stage cost tracing/allocation clearly affect the performance of costing systems, and these intermediate cost objects may themselves be highly important. For example, the representatives of FinnBakery perceived that many benefits were obtained by directly tracing some overhead costs to production lines, and subsequently also the control of costs began at this level (e.g., the close following of maintenance costs per production lines).

Companies may also decide to accumulate certain costs to cost pools without further assigning them to products (c.f. instance C). For example, FinnMechanics could have assigned manufacturing overheads to product families, without further assigning them to product variants. Therefore, alternative cost objects may themselves be important and no further benefit is obtained by forcing the allocations on products. If the purpose is to control costs at the cost center level, further allocation of these costs may not be necessary. It may also be argued that some costs are not related to products, but rather to some other final cost objects (Sharman 1998), in which case allocation to the customer could be preferred (c.f. instance D). FinnBakery allocated delivery costs primarily to customers instead of products, since they were judged as being more related to the characteristics of customers (i.e., location and size). Significantly different customer profitability figures would have been obtained if the company had decided to allocate these costs to products, and then only accumulate them at the customer level, by simply accounting for the volume and mix that each customer orders. As Mevellec (2009) pointed out, one might easily get the impression that further information is generated in this process, but all the information is actually already there at the product level. It might still be beneficial to also allocate these costs to products, since they are perceived as giving the correct impression of the average delivery costs of each product throughout the entire customer base. Finally, there are also some costs that could be allocated to products, but also traced to some other final cost object (c.f. instance E). For example, FinnMechanics could trace some costs directly to customers, projects, or market segments, which it prefers instead of allocating these costs to products. Tracing some costs directly to projects, customers and market segments, allows for the possibility of creating a cost object hierarchy that uses the principles of contribution accounting (e.g. Sharman 2003). Therefore, it is possible to analyze how projects contribute to customer level costs, and the ways in which customers contribute to the costs at the market segment level.

The question of borders of product costing systems is an important one, since the current discussion of cost system design choices and sophistication is heavily concentrated on the allocation of indirect costs to products (Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). However, it is somewhat questionable as to whether the product costing system and related allocations form any coherent unit of analysis, since all the costing systems are eventually comprised of multiple cost objects and the various relationships among them. Product costing systems and costing systems are even commonly used as synonyms, highlighting the fact that the role of other cost objects is also currently more explicitly recognized (e.g. Brierley 2008). On the basis of the case evidence, satisfaction with costing systems does not stem directly from the extent of cost allocations to products, but rather from the appropriate selection of cost objects and associated assignment choices in general. In fact, many previous problems in both case companies were partly related to the lack of appropriate cost objects in the formal costing system. For example, many supporting services in FinnMechanics were not regarded as separate cost objects, so they appeared to be free from the perspective of sales personnel. This created an unnecessary incentive to give these services for free when customers just demanded them, but it also distorted the product cost figures since these costs were eventually allocated to all products through material and labor overheads. In a similar manner, FinnBakery suffered from attempts to allocate some costs to individual customers, although almost none of the related marketing decisions could be made at that level. In conclusion, companies have different choices with regard to the borders of their costing systems, and these choices affect the structure of cost objects and related assignment choices. Piper and Whalley (1990) pointed out that ABC systems are almost always compared to the simplest possible alternatives (i.e., so-called traditional costing systems with a single cost pool and cost driver), while other viable solutions, such as contribution accounting, are ignored.

This discussion pointed out that the structure of costing systems is commonly far more complex than the depictions of the two-stage allocation process would suggest (c.f. Figure 7). The design task is not only to determine the required cost pools and cost drivers, but also to define appropriate cost objects and identify which costs are traced and allocated to which cost objects. The fact that other cost objects are used to allocate costs further to products especially highlights the difficulties related to the exclusive focus on the structure of second-stage allocations. The first-stage design choices are equally important and might play a crucial role in performance of costing systems (Datar & Gupta 1994). There is not a basis to assume that the allocations to products would be somehow preferable when compared to the alternative of directly tracing the costs to some other cost object (Sharman 1998). As a result, the performance of the costing system may not be explained by focusing solely on the allocations from intermediate cost pools to products. This might partly explain why the contingency studies have not found a relationship between sophistication and product diversity or share of indirect costs, which are commonly mentioned as being the most obvious reasons for implementing a sophisticated costing system with multiple cost pools and cost drivers (e.g. Cooper 1988b, Cooper & Kaplan 1988a). Companies with a high share of indirect costs may simply limit the scope of the costing system to manufacturing costs, or may prefer to trace a high share of these costs to other cost objects (i.e., a high share of indirect costs in relation to products may indicate that a high share of costs are actually direct to some other cost object). In a similar manner, companies with standard low diversity products might actually adopt more sophisticated costing systems simply because the nature of products enables them to use a meaningful averaging process. Therefore, the similarity of products enables them to make judgments regarding the relationships between indirect costs and products. When considered together with the issues raised in previous chapters, the extent to which the number and nature of cost pools and cost drivers truly reflects the accuracy of costing systems is somewhat questionable. As a result, the current discussion around cost system design choices and sophistication may not provide an adequate understanding of the factors that affect the performance of product costing systems.

6.1.5. Role of accuracy in explaining the performance of product costing systems

The accuracy of product costing systems has obtained considerable attention during recent years, and the previous chapters have primarily focused on the problems related to the concept of accurate product costing systems. The discussion showed that the accuracy of product costs has some serious ontological problems (Armstrong 2002), is currently limited to the handling of indirect product costs (Brierley 2008) and cannot be correctly measured through the number of cost pools and cost drivers that are used in the second-stage of the allocation process (Datar & Gupta 1994). However, the issue of whether the accuracy of product cost information is important (or as important as described in the literature) in the first place can also be questioned. It might ultimately be that the failure of ABC do not stem directly from the concept itself, but instead from the excessive focus on accuracy and other technical variables at the expense of behavioral and organizational factors (Shields 1995). For example, Brignall (1997) argued that researchers may have focused on the wrong area when trying to solve the “allocation problem” (i.e., to provide accurate product costs), rather than improve cost engineering by means of ABC. In particular, when the purpose is to understand the performance of costing systems it might be that the alleged accuracy, together with number/nature of cost pools and cost drivers as proxy measures, are quite poor indicators. Therefore, it might be beneficial to address the situation from the wider perspective (c.f. Figure 15), which recognizes the multiple requirements that are set for the information that is provided. As understood by the information quality literature, high-quality information is not only accurate, but also contextually appropriate for the task, as well as clearly represented and accessible to the user (Pipino et al. 2002). Although it has often been assumed that decision-making may be enhanced by simply providing more detailed and accurate information, it might also be that there is too much information at too detailed a level in the first place (Ackoff 1967).

It has often been argued that MIS are designed to produce ever more accurate, specific and current information, without paying much attention to the needs of users (Gorry & Scott Morton 1971). Although this is likely true in many cases, it might also be that the users are simply incapable of communicating their needs by any other means at the beginning of the design project. In both case companies, the potential users of cost information constantly stressed the importance of intrinsic information characteristics, primarily accuracy, during the initial planning phase. Their conception of accuracy was nevertheless quite different from that which is cultivated in the cost accounting literature (e.g. Noreen 1991, Labro & Vanhoucke 2008). People seemed even unable to define what was meant or targeted by the “product cost” (e.g., marginal, average, standard, etc.), simply aiming at figures that tell “how much it costs to produce the products” (Geiger 1999b). They also had clear difficulties in interpreting the various cost system design choices (e.g., cost pools and cost drivers) and their likely impact on the produced cost information. For example, FinnBakery ultimately used direct materials to allocate warehousing costs (i.e., costs related to handling of ingredients) to products, referring to this as a “cause-and-effect” cost assignment (see e.g. Hansen & Mowen

2006). However, the majority of the high volume products that ultimately absorb the vast majority of warehousing costs are actually rye breads that are solely baked from rye, water, and salt (i.e., they do not generate much work in the warehouse). As a result, it could be argued that direct labor costs would be an equally justifiable selection from the accuracy perspective, since they also correlate highly with material usage. However, since warehousing costs are logically perceived as being related to materials and not to labor, the former is held as an accurate allocation base while the latter is not. Therefore, the conception of accuracy appears to be related more how fair or reasonable the cost allocation is perceived to be than to any true causal linkage between the costs and the cost objects.

On the basis of this evidence, it might be that when trying to understand the performance of a product costing system, accuracy is not the most important factor even within the category of intrinsic information quality characteristics (Wang & Strong 1996). An alternative plausible hypothesis is that the objectivity and believability of information largely determines whether it is actually used by the individuals. As believability refers to “the extent to which data is regarded as true and credible” (Pipino et al. 2002), it actually closely captures what the people in the case companies appeared to mean by accuracy. In order to be used, it may be sufficient that the logic of a product costing system is compatible with the common sense of the people who intend to use it (e.g., material costs do not affect delivery costs, etc.). Clarke (1997) found some empirical support for this hypothesis, reporting that in Ireland the main reasons for choosing cost allocation bases included the existence of a logical association, simplicity, and clerical convenience. In fact, fewer than 15% of the companies looked for any strong statistical relationships between the cost pools and their allocation bases. This was also true in FinnBakery and the actual correlation between costs and cost drivers appeared not to be of any interest to anyone. In a similar manner, the role of objectivity appeared to play quite an important role in the case companies, especially when there was an obvious juxtaposition between the various parties that were involved in the cost system redesign process (e.g., the sales and production departments in FinnBakery). Pipino et al. (2002) used objectivity to refer to “the extent to which data is unbiased, unprejudiced, and impartial”, but this requirement was also related to the process through which the information was produced. For example, the sales manager of FinnBakery was more willing to rely on information that was provided by the researchers (i.e., a third party) than the production managers, who were perceived as pursuing their own ends. Although these findings somewhat downplay the role of accuracy in explaining the performance of product costing systems, the fact that accuracy, believability, and objectivity are all interdependent concepts remains to be recognized (Strong et al. 1997). Therefore, it is highly unlikely that cost information can be regarded as highly believable without being somewhat objective and accurate.

Although the accuracy of cost information was quite strongly highlighted ex ante, the performance of a costing system cannot be understood (solely) on the basis of the intrinsic information characteristics in either of the case companies. In fact, the mere act of providing allegedly more accurate product cost figures for the decision-makers did not lead to any major impact. Rather, it was a precondition through which individuals became interested in the various contextual and representational factors that eventually made the information relevant and usable in a particular decision-making context (Wang & Strong 1996). While FinnMechanics began to design specific pricing models based on cost information, FinnBakery focused on establishing a pricing tool that could be used to manipulate and represent the cost information in a desired manner. During the integration of the cost information as part of the existing decision-making procedures (c.f. Chenhall & Morris 1986), further requirements for timeliness, scope, aggregation, level of detail, ease of understanding, and interpretability were raised. It is also notable that people rarely pointed out the improved accuracy of product cost figures when discussing the benefits of the cost system redesign projects. The representatives of Finnbakery mentioned accuracy of product costs, but also highlighted the importance of enhanced communication, changes in the established way of thinking, possibilities of estimating product costs in advance, possibilities of analyzing various scenarios, and the value of the process itself as a learning experience. Many of the same benefits were also stressed in FinnMechanics, but the flexibility of the system and possibilities of estimating cost differences (in terms of direct costs) among the product variants were also pointed out. These benefits likely had much to do with the perceived accuracy of product cost information, but also with many other design choices that were not directly linked to the specific structure of cost allocations. It also appears plausible that these benefits were partly linked to various behavioral and organizational factors, and not only to technical design choices (Shields 1995).

On the basis of the case evidence, the relationship between accuracy and performance of costing system is far more complex than has been commonly assumed in the literature (Drury & Tayles 2005). People appear to stress the importance of accurate cost information in their everyday dialogue, but then fail to act accordingly. The whole conception of accuracy among practitioners is closer to perceived fairness than any strict causal relationship between costs and cost objects. Sometimes it even appeared that the accurate cost allocation was simply the one that reflected the products capacity to bear these costs. As a result, the performance of the product costing system can only partly be understood and explained by referring to the intrinsic characteristics of cost information. If only intrinsic information characteristics would determine the performance of costing systems, standardized costing systems would be far more widely used (Geiger 2001). The use of, and satisfaction with, the system is likely to be at least equally related to the contextual and representational information characteristics, which affect the possibilities of benefiting from the cost information in a particular decision-making situation. If managers do not find the information useful, the system simply dies from lack of interest (Geiger 2001). It is still notable that the ultimate target is not the performance of the costing system, but the performance of the organization (Weill & Olson 1989). Although many other information characteristics might explain the performance of a costing system in terms of use, satisfaction, and perceived usefulness, the impact on organizational performance might still be strongly related to accuracy. The mere act of using product cost information may not lead to enhanced decision-making if the product costing system is incapable of making a correct diagnosis from the situation at hand (Malmi 1997b). Moreover, the system is likely to eventually die from lack of trust if the information does not reasonably represent underlying physical and economic realities (Geiger 2001). It seems unlikely that the sales managers in the case companies would ever have been interested in tailoring the cost information to their particular needs, without the project team's ability to demonstrate improved accuracy and level of detail (and related benefits). Therefore, it seems plausible that a moderate level of accuracy is a necessary, but not sufficient, precondition both for the use of a product costing system, and desired organizational performance. However, in order to obtain a genuine organizational impact, considerable attention should also be paid also to other design choices affecting the contextual, representational, and accessibility information characteristics.

These findings have several important implications with regard to the appropriate design of product costing systems. First, attempts to build highly accurate and detailed costing systems may fall into the trap of producing precise, but not useful, information for decision-makers (Geiger 2001). This might lead to costing systems that have only a minor impact on organizational performance, compared to the costs that are incurred in implementing and maintaining such a system. Second, although many people initially expressed their concerns regarding the accuracy of product costing only, they later became interested in other factors that eventually largely determined the performance of the costing system. If this is also more generally true, the frameworks that make a clear distinction between the "design" and "implementation" phases might not provide an adequate description of a successful cost system design process (Gunasekaran 1999). It might not be reasonable to expect that the users of cost information are capable of communicating their needs in advance without first truly understanding the various possibilities that exist. The users of cost information are rarely themselves accountants and the practical meaning of various accounting concepts (e.g., incremental/avoidable costs in FinnBakery) might only be revealed through attempts to exploit the information in a familiar context (e.g., the pricing of short-term orders). Third, the entire distinction between design and implementation stages might be misleading and irrelevant, since the ongoing work with both of the case companies shows that the costing systems are constantly transforming along with the operational environment (Justesen & Mouritsen 2011). This relationship is also likely reciprocal in the sense that the costing practices actively shape the environment in which the company operates. Due to the changing environment, the relative importance of different information quality characteristics may also change over time, and the task of providing high-quality information is like tracking an ever-moving target (Wang & Strong 1996). However, this does not need to lead to constant changes in the structure of the allocation system itself; many contextual, representational and accessibility characteristics can be affected by filtering, aggregating, and representing the information in a different manner.

6.1.6. Implications for contingency-based research on cost system design principles

On the basis of the conceptual work and presented case evidence, it appears that the current discussion around cost system design choices and sophistication provides somewhat limited understanding of the factors that affect the performance of product costing systems. This literature easily conveys a view that the design of costing systems concerns only the selection of the number of cost pools/cost drivers required and identification of which cost drivers to use (c.f. Cooper 1989a). As Brierley (2008) pointed out, practitioners conceive of sophistication more broadly, and also include aspects that are related to the potential use of the system. This dissertation strongly supports this stance, especially when the term is used to refer generally to design choices affecting the performance of costing systems. Broad terms, such as sophistication, should not be used to describe only one aspect of the system, especially when it has a positive undertone that gives an impression that a greater number of cost pools and cost drivers would be always preferable. The cost pools and cost drivers related to indirect cost allocation to products is only one relevant aspect of cost system design, many other design choices also affect the performance of costing systems. Although Brierley (2008) suggested that different aspects of sophistication could be addressed by using various prefixes (i.e., overhead assignment sophistication, inclusion of all cost sophistication, understandability sophistication, etc.), the stance adopted here is that it would be preferable to directly discuss the complexity, scope, and understandability accordingly. These terms will more directly refer to the real-life phenomena that are targeted by these constructs. If sophistication as a term is still used, it should rather be defined from the user perspective and somehow describe both the structural elegancy and practical relevancy of the system, which is also closer to the way in which practitioners appear to interpret the term. In essence, the problem becomes quite close to being one that exists between "quality as excellence" and "quality as value" (Reeves & Bednar 1994). Sophistication as excellence postulates that a more accurate costing system is always better, while sophistication as value balances the benefits and costs related to different features of the system. Both definitions naturally have their pros and cons, and it is likely the purpose of use that eventually determines the more relevant one.

The existing literature appears to prefer the sophistication as excellence analogy, which is understandable in those instances where the sophistication is used as a specific construct (Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007). However, given the narrow operationalization of the construct, it remains preferable to discuss the complexity. Even if all the variables that Drury and Tayles (2005) proposed were actually measured through surveys, they would still capture only some aspects of the relevant cost system design choices. The problem is that by merely changing the name of the construct, it is not possible to remove the problems related to inconsistent findings and low significance levels. In order to do that, the research designs and theoretical linkages between the contingency variables and appropriate design of the costing system must become more realistic (Meredith 1998). This requires more profound understanding of factors that affect the performance of costing systems, since also the contingency studies adopting the selection approach to fit are ultimately dependent on this relationship (Weill & Olson 1989). They seek statistical relationships between contingency variables and established constructs (i.e., sophistication in this case), based on hypothesized relationships that are derived from the assumption that a certain type of costing system is more effective under certain conditions. However, if the performance of the costing system is largely dependent on factors that are not actually measured in the study, there may not be identifiable statistically significant relationship between the construct and contingency variables, even if companies actually only operate costing systems that are appropriate to their particular contexts. Naturally, the entire concept of fit might also be invalid (Gerdin & Greve 2004). This dissertation has provided some evidence that cost pools and cost drivers might be poor indicators for the performance of costing systems, so the explanations derived solely from the accuracy of cost information may not provide any consistent findings. This is especially true, given the ontological problems related to the concept of accurate indirect cost allocations (Armstrong 2002) and the multiple alternative choices available to configure functionally similar product costing systems. Although intense competition may create the demand for more accurate cost information, it may lead to more extensive direct cost tracing instead of an increase in the number of cost pools. For as long as many unrecognized variables continue to cause significant variation in the data, consistent relationships may be difficult to find (Meredith 1998). Moreover, mere statistical relationships cannot necessarily be regarded as valid theoretical contributions without viable explanations (Bacharach 1989).

One possible way to continue contingency-based research into product costing systems would be to abandon the artificial constructs (e.g., complexity and sophistication) and focus directly on the measurable cost system design choices (e.g., number of cost pools). The entire idea that costing systems could be described as forming some kind of measurable one-dimensional continuum appears highly questionable (Abernethy et al. 2001). On the basis of the comparison of established costing systems, it seems far more plausible that various costing systems are so different in many important aspects that it is impossible to place them in any linear line that would still bear any correspondence to real life (or the performance of systems). For example, although complexity would depend only on the number of cost pools and cost drivers, it would be impossible to judge how these two dimensions of complexity should be weighted in order to find a single measure for the construct (Al-Omiri & Drury 2007). Therefore, it would still be impossible to objectively compare different costing systems to one another (Al-Omiri & Drury 2007). In attempting to use constructs such as sophistication, the present research appears to aim solving the entire problem of cost system design, while it would be already beneficial to provide some insights regarding much smaller design issues. For example, Al-Omiri and Drury (2007) used a number of different types of second-stage cost drivers as a proxy measure for cost system sophistication, while the number of cost drivers could itself also be a studied variable. Some contingency variables could correlate with the number of cost pools, while others might be related to other essential cost system design choices. In this manner, it could be possible to find relationships with greater consistency between the important cost system design choices and the studied contingency variables. The ultimate purpose of contingency-based accounting research is to understand how cost system design choices are, and should be, made (Drury & Tayles 2005). This understanding is likely to increase more if there is a direct focus on these choices as such, and not some fictitious constructs that are meant to describe some artificial combination of these choices.

Although the recognition of different types of sophistication (Brierley 2008), together with a more extensive direct focus on concrete cost system design choices, might have some potential to advance research in this field, it might also be that the rationalistic and deterministic world view that is incorporated in many contingency-based research settings is simply never capable of capturing all the complexities related to cost system design choices (Weill & Olson 1989). There are likely to be some reciprocal and nonlinear relationships among the recognized and unrecognized variables, and these are not easily captured by means of large-scale surveys. Is it not out of the question that cost system design choices may also have an impact on strategy and structure, and not solely the other way around. FinnBakery, for instance, decided to leave the pastry business and focus solely on plain bread, largely on the basis of produced cost figures. Costing systems do not simply reflect the changes in the operational environment, but also actively shape that environment by describing it in specific manner for various people (Justesen & Mouritsen 2011). It might also be that the relationship between product diversity and number of cost pools and cost drivers is curvilinear instead of linear. Therefore, it might be that both extremely low and extremely high product varieties create conditions under which a product costing system with only a few cost drivers is adequate. In the case of low product diversity, even simple product costing systems with only a few cost drivers can be fairly accurate (Cooper 1988b). However, when there is extremely high product variety (e.g., in FinnMechanics), companies might be unable to establish any cause-and-effect cost drivers between the indirect resources and products, and so focus their efforts rather on direct tracing and alternative cost objects. As a result, it might be that the most fruitful position for establishing a complex product costing system with multiple cost pools and cost drivers is moderate product diversity (e.g., FinnBakery), which simultaneously creates the need for additional cost drivers and enables the use of a meaningful averaging process. In order to research these types of complex relationships, further case studies are needed. When possible relationships have been identified, appropriate statistical methods for testing these contingency hypotheses by means of surveys can also be selected (Gerdin & Greve 2008).

It is important to highlight that the proposed sophistication as value concept does not provide any direct remedy for contingency-based accounting research. Although it might be more relevant from the practitioner point of view (i.e. it may provide a better starting point for efforts of building appropriate costing systems), it does not simultaneously lend itself to direct measurement. If the sophistication is defined subjectively from the user perspective, it means that the same product costing system might be perceived as both sophisticated and unsophisticated by different persons or companies. However, the definition of sophistication through information characteristics provides some interesting ideas, both for the practical efforts of building useful costing systems and related contingency-based research. Future studies could attempt, for instance, to improve understanding of the relationship between costing systems performance and various information characteristics (Chenhall & Morris 1986). This is actually quite close to the approach adopted by Pizzini (2006), who attempted to analyze the ways in which the managers' evaluation of the relevance and usefulness of cost data was correlated with the level of detail, aggregation, and timeliness. There remains a need for further such studies in the manufacturing context and in relation to more general characteristics of cost information. By gaining a more profound understanding of these relationships, it might also be possible to draw some conclusions regarding actual cost system design choices that must be made. With regard to the value of the proposed framework in assisting this task, it must be recognized that the framework is also essentially based on rationalistic principles. It proposes that the contingency variables affect the relative value of various information characteristics, which is further reflected in the cost system design choices. However, the case evidence shows that people may not be capable of defining these requirements and needs in advance, and that the actual design process is not always guided by careful analysis. As a result, the framework may be incapable of explaining much of the variation relating to the designs of existing product costing systems. This simultaneously highlights the potential normative value of the framework. Since it more comprehensively depicts the various viewpoints, information characteristics, and design choices that must be balanced when designing a costing system, it might have the potential to assist in designing costing systems that fit to prevailing circumstances. Ultimately, management accounting belongs to social sciences, which are characterized by the changing nature of studied objects (Malmi & Granlund 2009).

The idea that sophistication could be defined from the subjective user perspective also reminds us that many important, but omitted, contingency variables remain to be further studied (Drury & Tayles 2005). If the purpose is to comprehensively examine and understand the performance of costing systems, it might be necessary to include some behavioral and organizational variables in the contingency-based studies (Shields 1995). With regard to FinnBakery, many benefits were derived from the improved communication among various people, which is not necessarily directly related to any structural design choice. One promising contingency variable is the purpose of use, which is likely to affect cost system design choices and the perceptions regarding the performance of costing systems (Schoute 2009). Since it has been already accepted that information requirements may vary from one purpose of use to another (Gorry & Scott Morton 1971), the developed framework would logically propose that the appropriate cost system designs also differ accordingly. If the purpose of use significantly affects the appropriate design of a product costing system, this omitted contingency variable may further help in explaining why contingency studies have provided only little information regarding the appropriate design of costing systems under specific circumstances. Before this relationship could be researched further through the survey methods, some insights through case study research need to be first provided. This is essentially the aim in the second part of this discussion. As Chapman (1997) argued, contingency studies need not be restricted to surveys, but contingent arguments can also be ()provided by other research methods.

6.2. Design of product costing systems to support particular purpose of use

6.2.1. On the diverse use of cost information in pricing

The marketing, strategy, and economics literature may easily convey the view that pricing is a relatively mechanistic, simple, and costless one-off task, through which a certain price level ("a number") is fixed for a new product at a specific moment of time (Dutta et al. 2003). The case evidence has clearly highlighted some deficiencies in this view, which might hinder the possibilities of understanding the actual use of cost information in price-setting through these lenses. First, the manner in which the case companies used cost information to support their pricing decisions cannot be reduced to mechanistic application of calculation rules on top of the average product cost figures. The cost information was not used as just an "answer machine" that was somehow capable of revealing the correct prices, but actually served many other purposes in both companies (Burchell et al. 1980). Second, the pricing was neither a simple, nor a costless, task, but involved multiple products, product families, product lines, customers, orders, projects, market segments, distribution channels, geographical areas, and competitors. The pricing problems were also commonly interconnected with other important decisions, so they could not be solved in isolation (Monroe & Della Bitta 1978). As a result, there was a need for coordination and compromises among various people and departments, and this further complicated the decision-making (Brennan et al. 2007). Third, pricing could not be interpreted as a single decision regarding the price level at a specific point of time. It was rather a process through which prices were set, monitored and altered, as required (Monroe & Cox 2001). It also related to the strategies, tactics, and policies that determined the sequence and timing of price changes, discounts, and promotions (Tellis 1986). Without an understanding of this multifaceted nature of pricing, an overly simplistic view regarding the role of cost information may be easily obtained.

One likely implication of the simplistic view of pricing is that the use of cost information in this regard is commonly associated with the calculation rules that are used to fix certain relationships between the product costs (either variable or full-cost) and prices (Smith & Nagle 1994). Although cost information played a major role in both case companies, there was no evidence of such strict cost-based pricing rules or routines. For example, FinnMechanics set list prices directly by applying contribution margin requirements on direct labor and materials, which could easily be interpreted as a cost-based pricing practice. However, the contribution margin requirements were selected to reflect the current market situation and prices, highlighting the importance of market-based factors (see e.g. Skinner 1970). When the cost basis for calculating prices was altered, the contribution margin requirements were also reselected in a manner that ensured that the average price level for the product was not changed at all. This is not compatible with the descriptions of cost-based pricing procedures (Baxter & Oxenfeldt 1961, Skinner 1970), since it actually means that while the amount of direct costs increased, the burden for overhead costs simultaneously decreased by the same amount. The unit cost figures were clearly not used to determine the price level for a product, but rather to harmonize the prices of different product variants in relation to each other. The fact that the differences in prices could be justified on the basis of the differences in costs (regarding the different product variants of a single product) was perceived as an important means of promoting trust, loyalty, and perception of fairness among the long-term customers (see e.g. Urbany 2001). Therefore, it helped in implementing the overall business strategy. In a similar manner, FinnBakery appeared to place great importance on the product cost figures when determining the prices for new products. However, the question was more concerned with ascertaining whether the company could manufacture products for less than they could be sold for, rather than the other way around (sales manager appeared first even eager to manipulate the costing rules in order to get the price right). Therefore, the pricing process commonly began with price suggestions that could be selected for strategic reasons (Smith & Nagle 1994), and the cost information was used to analyze the likely impacts throughout the organization.

A typical example demonstrating the benefits of more accurate cost information in pricing simply shows that different costing systems produce different cost estimates, assuming that allegedly more accurate cost information directly leads to improved decision-making (e.g. Lere 2000). The rationale appears to be that improved congruence between costs and prices (i.e., higher costs, higher prices) leads to an improved organizational performance. Therefore, the role of a product costing system is viewed as that of an answer machine that can provide better answers if it is only properly configured (Burchell et al. 1980). However, the case studies suggested that the use of product cost information in this manner is rather limited, and costing systems also acquire other roles in pricing decisions. FinnBakery did not passively adapt prices to the current or expected level of costs (i.e., calculate unit costs first and determine prices accordingly), but rather used prices and other marketing mix variables to position products in a (strategic) manner that effectively exploited the capabilities of the existing production and delivery systems. In this process, the product costing system functioned as a learning machine (i.e., it provided ad hoc analyses, what-if models and sensitivity analyses), which enabled managers to learn more concerning possible alternatives and their consequences before the actual decisions were made (Burchell et al. 1980). Since the pricing decisions had various operational consequences that were expressed in different units of measurement (e.g., lead-times, waste percentages, batch-sizes, inventory levels, etc.), costing information helped in translating these effects into common language, enabling discussion among managers from various functional areas (Wouters & Verdaasdonk 2002). Although it was naturally impossible to accurately depict these relationships in any particular instance, the mere presentation of different trade-offs (e.g., higher price and lower batch-sizes) sparked further discussions among managers where the consequences were more thoroughly analyzed. This was also perceived as being highly important, since the managers in FinnBakery commonly stressed the improved communication and coordination as being the major benefits that were obtained by redesigning the product costing system and related organizational practices. The improved communication also stimulated learning of entire organizational functioning, which further enabled the managers to more clearly understand their own roles and tasks. As a result, they began to pay attention to the consequences of actions that were not directly realized in their own areas of responsibility.

As Burchell et al. (1980) pointed out, the functioning of an accounting system as a learning machine is potential when there is considerable uncertainty regarding the causal effects of the decisions. Especially in case of new product pricing, such uncertainty is very much present, and pricing decisions are commonly made with little information relating to the variables that may affect their success (Monroe & Della Bitta 1978). Particularly in case of new product pricing, such uncertainty is very much present and the pricing decisions are commonly made with little information on the variables that may affect their success (Monroe & Della Bitta 1978). From the decision maker's perspective, there are two primary sources of uncertainty; 1) the way in which the selected pricing strategy will affect the organizational processes and the cost structure of the product (i.e., the internal response), and 2) how the customers and competitors react to the proposed marketing mix, eventually determining the demand and sales volume for the product (i.e., the external response). Although there has been considerable research into demand curves and their position, shape, and elasticity, managers commonly perceive demand factors as being out of the control of the company (see e.g. Diamantopoulos & Mathews 1993). Therefore, the focus on likely cost implications (primarily occurring within the company) may provide them with an important means of reducing the perceived uncertainty related to the financial consequences of the decisions. As Urbany (2001) pointed out, carefully measured cost information may be perceived as concrete, vivid, and unambiguous when compared to more fuzzy factors, such as demand response or competitive reactions. In addition to reducing the total uncertainty related to decision, cost information may also help to limit the financial risk related to uncertainty of demand. By understanding the sensitivity of cost structure in relation to sales volume, it may be possible to position the product (i.e., select a pricing strategy) in a manner that minimizes the consequences of unsatisfactory demand. FinnBakery never learned to predict sales volumes precisely, but it learned to limit negative consequences by not pursuing high-price policies with its low-volume niche products. This type of attempt had previously backfired through plummeting demand, extremely high unit-costs, and long delivery contracts with retail chains.

Given the interfunctional nature of pricing decisions, they easily become a battleground for various different departmental and personal interests and objectives (Smith 1995). Although various stakeholders in pricing decisions (e.g., production, product development, sales, finance, etc.) may subscribe to the company's overall interests, they are likely to have their own (intrinsic) interest in addition (Donaldson & Preston 1995). This was clearly visible in FinnBakery, where the interests of sales (i.e., sales volumes, market shares, and contribution margins) and production departments (i.e., batch-sizes and efficiency) colluded on a constant basis. While this highlights the potential role of accounting information as an "ammunition machine" (e.g., the production managers used the product cost estimates to legitimate their claims for fewer products and longer production runs), it also suggests that the top management may use the costing system more strategically to balance various interests (Burchell et al. 1980). Therefore, the potential that costing systems have to enhance communication and coordination may be used to actively guide the desired action in the organization and among the various stakeholders (Simons 1995). The CEO of FinnBakery especially stressed this view and also used the costing system and related practices in this manner by establishing a common method of measuring the profitability of products and pricing decisions. By understanding the profitability through the product's ability to generate a contribution (defined in a specific manner) to each production hour (i.e., a scarce resource), production and sales managers were forced to search for solutions that generated sales and contribution, but which also effectively used production capacity (i.e., they were guided to streamline their objectives). The costing system and related apparently cost-oriented pricing rules and practices were therefore rather used in controlling the process through which the prices were determined, than in their actual determination. The proposed marketing mix (including price) could be almost anything as long as it was the result of careful analysis of various alternatives and could satisfy some minimum requirements that were placed on all products. Similar behavior was also evident in FinnMechanics, where cost-oriented pricing rules were used to limit the discounts that the sales representatives were authorized to give to customers.

The case evidence clearly shows that the use of cost information in pricing cannot be reduced to a process whereby mark-ups or contribution margin requirements are used to calculate product prices (Shipley & Jobber 2001). The use of cost information may take various forms (e.g., answer machine, rationalization, etc.) and serve various purposes (e.g., coordination of actions, price stability, etc.). It is also crucial to notice that the importance and role given to cost information in pricing may vary, depending on the nature of the decision (e.g., a discount to selected customers, a price promotion for a selected market, new product pricing, etc.), the life-cycle of the product or the individuals involved in the decision-making (Smith 1995). For example, FinnMechanics used the cost information rather mechanistically to formulate list prices that better reflected the cost differences among various product variants. Since some cost conscious customers had earlier complained about certain inconsistencies among the prices of different product variants (e.g., it could cost more to select a specific actuator for a bigger than a smaller product, although the component and mounting were identical), the company wanted to make the price differences more transparent and justifiable to the customers. This was believed to enhance trust and a perception of fairness, which are important determinants of customer loyalty (Herman Diller 2008). These ends also partly justified the use of cost information in project pricing, but the cost-based procedures were also used to simplify complex decision-making situations by reducing the variables that had to be considered in these instances (Ahmed & Scapens 2003). Since the basic steel structures among the various projects were commonly highly similar, their elimination from the pricing problem reduced complexity and focused efforts on distinguishing characteristics between the projects (also promoting price stability among the various customers and sales representatives). It was also an important way to reduce resources required to generate quotes, since the final prices were always negotiated face-to-face based on the basis of the final specifications. Hvam et al. (2006) has drawn similar conclusions, by describing how a product configurator with associated cost and price models may fasten the quotation process. The important thing is that there are probably multiple ways to use cost information, even within the company.

6.2.2. Common requirements stemming from pricing as a purpose of use

The previous chapter pointed out that cost information is used to support pricing in multiple ways. At first sight, it is therefore rather challenging to identify any common requirements placed on cost information that could be viewed as "inherently present" in pricing decisions. Conversely, if such requirements can be identified from the case studies, which represent polar types when it comes to pricing environments, there is a good chance that they might also have some external validity; i.e. it may be possible to generalize the findings from the data and the context of the research to other populations and settings (Meredith 1998). The problem is that there is virtually no literature regarding the required characteristics of information from the managerial task perspective (Tillema 2005). The pricing literature simply commonly stresses the importance of "outward-looking" information, regarding market characteristics, customer valuations, and competitors' prices and actions, but does not discuss the requirements placed on "inward-looking" cost information (Indounas 2009). Conversely, the management accounting literature has touched on the issue, primarily by pointing out some differences regarding the use of cost information for strategic and operational purposes (Kaplan 1988). Therefore, the best point of reference might actually be the framework provided by Gorry and Scott Morton (1971), who pointed out some distinctive characteristics of the information that is required for these purposes of use (see Table 12). Pricing is usually classified as a strategic purpose of use for cost information (see e.g. Schoute 2009), although Chenhall (2004) refused to make such a division. Although a strict categorization of pricing as strategic aim appears fairly dubious, the framework may still be used to point out certain characteristics of information that are usually highlighted in pricing.

Table 12. *Information requirements by decision category (Gorry & Scott Morton 1971).*

Characteristics of information	Operational control	Management control	Strategic planning
Source	Largely internal	→	External
Scope	Well defined, narrow	→	Very wide
Level of aggregation	Detailed	→	Aggregate
Time horizon	Historical	→	Future
Currency	Highly current	→	Quite old
Required accuracy	High	→	Low
Frequency of use	Very frequent	→	Infrequent

First, there is a need to highlight pricing as essentially a forward-looking function that is primarily interested in the products and services that will be sold to specific customers and regions in the future (Hicks 1992). In general, successful pricing practices are related to anticipation of competitive moves, sensing emerging trends and changes in market needs, and estimating the costs of producing, marketing, and delivering the products in the future (Indounas 2009). As a result, the costing system should help managers to analyze the future consequences of their decisions, not simply to monitor past performance. This distinction is highly important, since it might affect the suitable cost concept and money measurement practices. While average historical costs may well be optimal for control purposes, pricing should essentially focus on incremental/avoidable costs

(Skinner 1970). This was also somewhat evident in the established costing practices in the case companies. FinnMechanics did not even pursue the measurement of the historical costs through time sheets, and Finnbakery developed practices as to how historical cost figures could be manipulated to better represent the incremental costs of various decisions. In principle, there are at least two distinctive methods that can be used to estimate the costs related to a set of activities before they have actually been executed (Weustink et al. 2000). The analogical/variant-based method depends on the similarity between the new product and those previously manufactured, essentially using the historical cost records of closest match as a basis for cost estimation (Duverlie & Castelain 1999). In contrast, the analytical/generative method relies on breaking down the work required into elementary tasks, which can be used to estimate the incurred costs (Weustink et al. 2000). Although product costing systems are by their very nature backward-looking (i.e., they begin with the information provided by bookkeeping), there is always some potential to affect the value of produced information for cost estimation purposes (Johnson 1992). It is possible, for instance, to classify costs as variable/fixed regarding the relevant time period in question, to use budgeted instead of historical volume measures for activities, to apply imputed costs, to display trends regarding the development of material prices, or provide possibilities to perform what-if and break-even analyses (i.e. approach selected in FinnBakery). It is also possible to focus on activities in such detail that the commonalities among the various products become apparent (Raz & Elnathan 1999). Although each product variant and project in FinnMechanics can be viewed as unique, the basic activities that are required have repeatedly been carried out for various other products and projects. As a result, by using sufficiently detailed activities and feature-based modeling techniques, it is possible to generate reliable cost estimates regarding forthcoming product variants.

Second, despite the constant emphasis on the importance of accurate product cost figures in the costing literature, these figures do not appear to be vitally important from the pricing perspective. The management accounting literature is full of claims such as "…accurate cost information is likely to be crucial since the undercosting of bids can result in the acceptance of unprofitable business…" (Drury & Tayles 2006), but there are simply no full-cost figures that could be "accurate" in this sense. It might be possible to estimate the lifetime of the machinery and expected rate of its utilization, but any allocation of such costs to products is always arbitrary. Although the revenues from producing the products must repay these costs in the long-term, not all units or time periods must equally contribute to them (Shapiro & Sawyer 2003). The use of product costs in case companies is better explained through their role as important reference points, around which pricing practices and routines have emerged over time (Ahmed & Scapens 2003). Therefore, the various practices of using cost figures in pricing are more readily explained as heuristic rules of thumb, which are used to reduce the complexity of decision-making, create order in organization, stimulate learning among managers, and promote stability in industry (Lucas 2003). In these roles, the accuracy of cost information appears not as crucial, since the prices are eventually determined by other factors and cost information is more readily used to control the pricing process. For example, the sales representatives in FinnMechanics had learned to operate profitably, despite there being only a very simple and distorted product cost estimate to support the pricing decisions. Moreover, the radical changes in product costs did not lead to any major changes in prices, but rather to new routines and rules of thumb (e.g., contribution margin requirements on direct labor and materials) that were used to set and justify essentially the same prices. There was simply no automatic transmission of costs into prices, and even the benefits of knowing the accurate short-term avoidable production costs (i.e., the variable costs) can be questioned from the practical point of view. Since short-term pricing decisions almost always have long-term consequences (see e.g. Nagle 1993, Rao et al. 2000, Brennan et al. 2007), neither FinnMechanics nor FinnBakery agreed to sell products anywhere near to their genuine, avoidable costs. Therefore, while the prices of products are usually considerable higher than the variable costs, there is no self-evident mechanism as to why more accurate cost figures should lead to more profitable pricing decisions.

Pricing is likely to place also some other common requirements on cost information, but the intent here is only to point out that at least some can be identified. For instance, it could be claimed that the currency of cost information is not critical for pricing purposes, since pricing decisions are usually approached from a strategic perspective and constant price changes are costly to implement (Goldberg & Hellerstein 2007). It remains more important to note that these requirements do not concern only the content of the cost information itself, but the cost objects that are perceived as important are affected by pricing as a purpose of use. Although Cooper and Kaplan (1988b) originally claimed that virtually all the costs of organization (e.g., logistics, production, marketing and sales, distribution, etc.,) should be considered as product costs, the potential role of alternative cost objects is currently recognized (Gunasekaran 1999). The discussion regarding cost-plus pricing still appears to regard the product as a fundamental/sole cost object, since many examples demonstrate the way in which average product cost figures are used to set "everyday prices" (see e.g. Brennan et al. 2007 for an illustration). In this process, the desired profit margin is added to the variable cost of production (i.e., materials and direct labor) and allocated overheads (Baxter & Oxenfeldt 1961). Nevertheless, pricing is inevitably becoming more transaction-oriented, meaning that prices are differentiated on the basis of the characteristics of orders, customers, market segments, geographic regions, and many other important factors (Cross & Dixit 2005). The forces that have contributed to this development include the increased customization of product and service offerings, and the growing awareness that customers also differ in their consumption of resources (e.g. Simon & Dolan 1998, Smith 2006, Van Veen-Dirks & Molenaar 2009). As a result, it can be argued that a costing system must be capable of providing supporting financial information for the pricing of the same product for different customers, markets, channels, and geographical regions (Goebel et al. 1998). This may require that managers soften their focus on levers at the plant level (e.g., volume, and average cost of production) and gain insights regarding the true profitability of each customer and transaction (Ahlberg et al. 1995). This is only possible by enhancing the understanding of customer-related costs and their behavior (Foster & Gupta 1994).

Given the nature of pricing as a market-oriented function, the importance of the customer-related hierarchy of cost objects (e.g., order, customer, customer group, market segment) is likely to be highlighted in the cost system design (Van Veen-Dirks & Molenaar 2009). If the cost of serving various customers and operating multiple channels varies considerably, it is probably more beneficial to attempt to measure these differences instead of forcing allocations on products (Sharman 1998). This might affect the scope of product costing (e.g., whether to focus solely on manufacturing overheads or on administration overheads in addition), and also the emphasis that is placed on various cost objects and their modeling. The mere aggregation of product costs at the customer level simply reflects the mix of products that each customer buys, but does not take into account the differences in order sizes, number of sales visits required, use of helpdesk, and many other important variables (Mevellec 2009). It may convey a somewhat fair view of the long-term cost implications for some purposes of use but it simultaneously provides poor support for the pricing of individual orders and particular customers (it may also be totally irrelevant, for instance, to outsourcing decisions). Customers may also place various requirements directly on production (e.g., demand ETO changes, additional inspections, and special packages in the case of FinnMechanics), which may affect the definition of products and services as cost objects. Baxendale (2006), for instance, pointed out that appropriate cost object selection may actually bundle the primary product up with secondary services (e.g., black paint to be delivered in 1 week), simultaneously better aligning the produced cost information with the level of decision-making. Despite the growing awareness of customer-related cost objects, some authors still claim that many costing systems are capable of instantly producing the cost of manufacturing a product with great precision, simultaneously having little or no ability to measure the costs to customers (e.g. Smith 2006, Van Veen-Dirks & Molenaar 2009). This might be one of the reasons why marketing managers perceive the usefulness of produced cost information as poor from the pricing perspective (Foster & Gupta 1994). For example, FinnMechanics did not want to develop complex overhead allocation structures for products, but would have considered any cost information regarding the projects, customers, and market segments as beneficial in pricing.

6.2.3. Other contingency variables affecting the use of cost information in pricing

The previous chapter pointed out that there might be some general requirements that are placed on cost information when the purpose is to support pricing. However, the established costing systems were different in many respects. This indicates that the appropriate design of a costing system cannot be solely determined on the basis of the purpose of use, rather the issue concerns the interaction effect of many different contingency variables. Therefore, the context in which the pricing decisions are made, and the manner in which the costing system is used, must be understood in order to explain the differences in cost system design. Similarly as purpose of use might be an important moderating or mediating variable between the intensity of competition and cost system sophistication, product diversity may affect the appropriate design of costing systems for pricing purposes (c.f. Gerdin & Greve 2004). On the basis of a limited number of cases, it is naturally impossible to specify any fixed “causal” relationships between these variables, but it may still be possible to shed some light on the important factors that appeared to affect the design of costing systems. Numerous variables may naturally partly explain the differences in established costing systems, but the role of overall business strategy (i.e., the focus on value generation versus production efficiency), the extent of reciprocal interrelationship between the departments and individuals (i.e., the need for cooperation between departments and the significance of consequences throughout the organization), and the time frame of decision-making (i.e., the short-term versus long-term perspective on pricing). These variables may partly explain why FinnBakery decided to introduce more complex indirect cost allocation methods and extend the scope of the system to also include administration overheads. They may also shed some light on why FinnMechanics applied only plant-wide burden rates and paid considerable attention to the direct labor costs of products.

The overall business strategy appeared to greatly affect the importance of cost information in the pricing and cost system design choices that were made. Although companies may have rather well-defined pricing objectives that highlight the importance of profitability, the pricing must always be viewed in the context of a company's general strategy for achieving its corporate objectives (Pass 1971). In this instance, FinnBakery operated in markets where products did not have many differentiating features, prices were relatively fixed, margins were low, and unused capacity called for the chasing of extra orders (see e.g. Ahlberg et al. 1995, Smith 2006). As a result, the business strategy was highly focused on efficient production, which was pursued by seeking ways to bring costs down and to ensure high capacity utilization. From this perspective, it is not surprising that the pricing practices placed a relatively strong emphasis on cost information, and that the company was also interested in developing indirect cost allocation methods. Conversely, the business strategy of FinnMechanics did not highlight efficient production as a source of competitive advantage, but rather focused on providing value-added products and services for long-term customers. This type of relationship marketing strategy aims at mutually profitable long-term relationships through customer satisfaction and loyalty, which should also be promoted through pricing practices (Ravald & Gronroos 1996, Indounas 2009). In FinnMechanics, pricing was viewed as a vehicle to consummate sale and sustain competitive advantage, rather than as a means to directly ensure the profitability of each sale (Smith 1995). In some sense, it was accepted that customer willingness to pay eventually determined the "right" price level and it is not required that different product variants, products, projects, and customers generate equal contributions. This was reflected in the importance given to cost information in pricing, and no attempt was made to introduce complex overhead allocation methods. The cost information was instead used to promote the price stability and perception of fairness that was attainable through a system that used differences in direct costs as a basis for the pricing of product variants. Either a constant update of the product cost information was not necessary, since the changes in costs could not be passed onto prices without risking the long-term customer relationships (Hall et al. 2000, Goldberg & Hellerstein 2007). As a result, the labor standards were only reviewed annually since they were not used to control the manufacturing function.

The need for cooperation among various departments and individuals (i.e., the extent of reciprocal interrelationships) also appeared to have a great effect on the role of the costing system in pricing, which was further reflected to cost system design choices. In general, pricing is claimed to have implications for other major functions, so pricing decisions should be coordinated among sales, marketing, operations, logistics, accounting, finance, and management departments (Smith 1995, Lancioni 2005). This was clearly the case in FinnBakery, where the pricing decisions directly affected the production and delivery arrangements. As a result, the unit cost figures were heavily influenced by the pricing decisions, but it was rather challenging to understand these mechanisms (e.g., lead-times, waste percentages, batch-sizes, inventory levels, etc.), without a system that helped to translate the effects into a common monetary language (Wouters & Verdaasdonk 2002). In this context, the ability to illustrate the impact that the decisions in one area made on operations throughout the company was perceived as an extremely important characteristic of the costing system (i.e. information characteristic referred as "integration" by Chenhall & Morris 1986). In order to make these relationships visible in Finnbakery, multiple hierarchical cost drivers were used (e.g., number of batches, amount of waste, number of pallets, etc.) and the cost information was presented in a manner that enabled the understanding of underlying assumptions. The value of using multiple cost pools and cost drivers in this context may not be related to more accurate cost information per se, but to the visualization of important trade-offs that it was necessary to make. After the likely consequences throughout the organization had been highlighted, managers actively cooperated and communicated in order to find the most suitable solution for the problem at hand. During this process, separate what-if analyses and simulations were made in order to gain an improved understanding of likely cost implications and their effect on the appropriate pricing strategy. In FinnMechanics, commonly made short-term pricing decisions were rather detached from other important decisions, and neither had any major influence on the unit cost figures. As a result, the use of cost information was more mechanistic and it was not necessary to depict any relationships among the departments. It was simply enough that the sales representatives had a single estimate regarding the direct material and labor costs of product variants, which could then be used to justify the price differences to customers.

The timeframe of decisions also appeared to have a clear impact on the appropriate design of the costing system. This is probably not surprising, since the pricing literature makes a clear distinction between short- and long-term decisions, which is expected to translate into the appropriate cost concept for the decision-making (Shillinglaw 1963). As already noted, it is typical of the bakery industry that new product-pricing decisions in particular generate long-term commitments, and prices cannot be significantly altered once the decisions are made. As a result, the most important goal for a product costing system appeared to be the estimation of long-term average costs, including fixed cost allocations (Johnson & Kaplan 1987b). The company representatives did not naturally believe that they would actually get rid of all these costs, but rather that all the new products should carry "a fair share" of these costs, while it would also be possible to introduce new products to fulfill the existing production capacity. In some sense, the fixed cost allocations therefore represented the perceived opportunity costs of manufacturing the product (Baxter & Oxenfeldt 1961, see e.g. Balakrishnan & Sivaramakrishnan 2002). Conversely, FinnMechanics usually prices its products on a transaction basis, so the implications of pricing decisions are only short-lived. As a result, long-term average costs are not particularly important in the first place and the system that treats fixed costs as periodical is better justified (Friedl & Pedell 2005). The issue is nevertheless not so much that the variable costs would provide a better basis for making pricing decisions, but that the fixed cost allocations are not perceived to provide any additional benefits. For example, during the recent recession (after the company had made an explicit promise not to dismiss anyone), the business controller of FinnMechanics stated that "this is the level of costs we are now committed, and they simply must be covered with the future cash flows". Therefore, the management had no plans to get rid of the "unused capacity/extra resource supply", but they were instead used to secure a future competitive advantage. The company still allocated some fixed manufacturing costs to products through burden rates, because it needed to draw a clear line with regard to the scope of the product costing system. It was perceived as important that the sales representatives clearly understood the costs that were covered by the unit cost figures and those that were not.

Ultimately, many other important contingency variables also appeared to affect the appropriate design and use of the costing systems. However, the purpose here is not to go through them all, since it would be impossible to draw final conclusions regarding their roles as individual variables. For example, the degree of customization could also be used to explain many of the observed differences in cost system designs. It is also possible that the observed practices may only be understood through a set of contextual and structural variables, and not individually through a single contextual factor – structural choice pairs (Drazin & Van de Ven 1985). As Gerdin and Greve (2004) pointed out, some scholars have opposed partial analyses of context and structure variables where the fit is interpreted as a continuum (i.e., the Cartesian approach) and have instead argued that there may only be a few states of fit between context and structure, that cannot be analyzed through a single contextual factor – structural characteristic pairs (i.e., the Configuration approach). Therefore, it may be that the system of different contextual factors must fit the system of structural characteristics, and that this relationship cannot be reduced to individual "fits" between separate variables. The important thing is that the purpose of use may be an important contingency variable in cost system design, since some of the requirements placed on the cost information vary among the different purposes of use. However, given that the system is used, for instance, to support pricing, the design of an appropriate costing system for this particular purpose of use is also dependent on other contingency variables that affect the context and nature of pricing decisions. A costing system that is used to support the pricing of standard products might place an emphasis on different characteristics (e.g., long-term average cost figures and indirect cost allocations) of the system used to support the pricing of individual projects (e.g., estimation of direct costs). It remains difficult to conclude whether these impacts are truly dependent on the purpose of use. For example, the customer relationship-oriented business strategy appeared to lessen the importance of accurate cost information in pricing decisions, but it might well be that this strategy also makes accurate cost information less important in general. Regardless, it appears to be clear that costing systems cannot be designed to effectively support pricing without considerable attention being paid to the nature of the pricing decisions that are to be made.

6.2.4. Purpose of use as a relevant contingency variable in cost system design

Generally speaking, there appears to be an agreement that the appropriate design of a product costing system is contingent on its intended purpose of use. For example, Kaplan (1988) claimed that companies should basically operate three different costing systems for three fundamentally different purposes of use. At this level of analysis, it is quite natural that the requirements placed on the cost information are likely to vary considerably, depending on the purpose of use. For example, the inventory valuation for financial purposes is heavily guided by legislation, which basically restricts the scope of indirect cost allocations for manufacturing overheads, but does not require that the methods of allocation "causally" relate the costs to products (Drury & Tayles 1994). As a result, it is more important to approximate the total amount of resources used to generate sales during a period than it is to accurately measure the resources consumed by each individual product. Despite this principal agreement, virtually no studies have truly addressed the issue of designing costing systems to support specific managerial tasks or purpose(s) of use. For example, Geiger (1999b) and Gunasekaran (1999) both stressed the importance of designing a costing system to support "existing managerial needs", but there is no guidance as to what this would mean in the practical sense. As a result, there is considerable evidence that costing systems are used for various purposes (e.g. Innes & Mitchell 1995, Innes et al. 2000), but almost no information as to how this is, or should be, reflected in the design of costing systems. Pricing is usually rated as one of the most important purposes of use (e.g. Schoute 2009), but neither the pricing nor the cost accounting literature is capable of giving guidelines (instead of providing more accurate cost information) as to how this should be accounted for when designing a costing system. It is only known that the managers responsible for pricing decisions are generally rather unsatisfied as to whether costing systems are capable of supporting their needs (Foster & Gupta 1994).

The case evidence has provided some support for the role of purpose(s) of use as a relevant contingency variable in cost system design. More specifically, it seems that 1) the requirements placed on cost information vary from one purpose of use to another, and 2) these requirements are, at least to some extent, reflected in the actual cost system design choices. First, the purpose(s) of use largely determines the cost objects that are perceived as relevant, clearly affecting the design of the costing system. A system focused on performance measurement and cost engineering may need to focus on activities/processes at a detailed level (Lere 2001), while departmental control might be better promoted by focusing on the functional cost centers. In a similar manner, a system used to support pricing is likely to place greater importance on customer-related cost objects than the system designed to support make-or-buy decisions (Goebel et al. 1998). Second, the purpose(s) of use affects the scope of the costing system and the structure through which the costs are allocated to various cost objects. For example, make-or-buy decisions may require the allocation of manufacturing overheads to part and subassembly levels, so that the long-term financial consequences of outsourcing their manufacturing can be estimated (Gunasekaran 1999). The purpose of supporting pricing may simultaneously require less detailed information, but broader scope, in terms of included costs. Third, the actual use of the cost information affects the contextual and representational requirements that are placed on the cost information. The purpose of supporting pricing in a decentralized organization may require a focus on the ease of understanding, interpretability and concise representation of the information. However, these characteristics are partly determined through the choices regarding the use of the system, and not necessarily through the structural design of the allocation mechanism. They are still important factors affecting the performance of the system, meaning that they may ultimately determine whether or not some individuals perceive the system as useful. As a result, the design of costing systems should begin with an analysis of the decisions that they are intended to support.

It appears that the purpose(s) of use is an important contingency variable in cost system design, so it might be useful to illustrate its relevancy through the commonly used hypotheses regarding the association between cost system sophistication (i.e., number of cost drivers and cost pools) and contingency variables (see Table 11 in chapter 6.1.1.). The most widely tested hypothesis in contingency studies has been that of a positive association between the higher levels of product diversity and the level of cost system sophistication (Drury & Tayles 2005). This is easily understood, since already Cooper and Kaplan (1988b) claimed that single plant-wide cost pools and volume-based cost drivers are more likely to cause significant distortions when products actually consume resources in different proportions. In order to provide accurate product cost figures in an operational environment with high product diversity, the costing system must exploit a higher number of cost pools and cost drivers. This is likely true if the costing system is used for cost modeling or cost reduction purposes, since the diverse production processes require complex costing systems for adequate modeling (Malmi 1999). However, the hypothesis rests solely on the assumption that the accuracy is highly valuable in the first place, and that companies are willing to invest resources in pursuing it. On the basis of the evidence presented in this dissertation, it could be also hypothesized that the accuracy of indirect cost allocations is not always an extremely important characteristic of cost information. Since the cost of measurement is likely to increase, along with the product diversity, this might actually mean that the cost-benefit analysis justifies additional investments in complex allocation methods only when the product diversity is moderate. FinnBakery used multiple cost pools and cost drivers to improve accuracy, since the modest product diversity (e.g., fairly standardized processes, similar products, etc.) enabled the cost-effective establishment of cause-and-effect cost drivers. Conversely, FinnMechanics decided to apply simple overhead burden rates, as more complex methods to allocate indirect costs would have required significant investments (without providing significant benefits). Therefore, when the accurate allocation of indirect costs becomes extremely complex due to high product diversity (or degree of customization), companies may judge the associated benefits minor when compared to additional costs. They might also simply perceive that there are no identifiable cause-and-effect relationships between the products and overhead costs. There is also some evidence to suggest that managers may perceive less detailed cost information more suitable for strategic decisions even in absolute terms (Schoute 2009).

The original claim in favor of using the more sophisticated product costing systems was also justified through the increased share of indirect costs in the cost structures of companies (Johnson & Kaplan 1987a). It was argued that a higher share of indirect costs in an organization's cost structure exposes that organization to bigger distortions under traditional product costing systems, so investments in more accurate systems are justified (Cooper 1988b). This has remained a basis for hypothesis development in contingency studies, and Drury and Tayles (2005), among others, expected a positive association between the proportion of indirect costs and the level of cost system sophistication. This likely occurs if the purpose of the system is, for instance, to expand the control of senior management to various staff departments (Armstrong 2002). However, since the majority of indirect costs are usually fixed by their nature, the entire relevancy of overhead allocation may be questioned from the pricing perspective (and also from the decision-making perspective in general). On the basis of economic theory, the most important cost concept for pricing purposes may be the marginal cost (Brierley 2008). More importantly, while the share of fixed costs increases, their allocation to products may convey less information for short-term pricing purposes. One example of this is the revenue management models that are used in many industries (e.g., airlines, hotels, etc.) that are characterized by a high share of fixed costs and perishable capacity (Bitran & Caldentey 2003). In these industries, the marginal cost of selling an additional unit is extremely low, so almost any price contributes to the covering of fixed costs and profits (Huefner & Largay 2008). As a result, the maximization of revenues simultaneously maximizes profitability, and therefore, the allocation of fixed costs to products becomes irrelevant from the pricing perspective. On the basis of these ideas, it might be that the relationship between the share of indirect costs and the need for cost drivers/cost pools is actually U-shaped, and not linear, when the system is assessed from the pricing perspective. It might be that the value of sophisticated overhead allocation methods is highest when the share of indirect (fixed) costs is neither extremely high nor extremely low. The allocations might naturally still be perceived as useful for other purposes of use.

The recognized contingency studies have also hypothesized a positive association between the level of cost system sophistication and the intensity of competition (e.g. Drury & Tayles 2005). The rationale behind the hypothesis is that firms operating under intense competition must have the capacity to assign costs more accurately to products, services and customers, while competitors are more likely to take advantage of opportunities that arise due to poor decisions (Cooper 1989a). Companies facing intense competition are also more likely to operate with low profit margins, which creates an increased danger that inaccurate costing systems may overcost or undercost products to such an extent that profitable products are discontinued on the basis of the cost information (Al-Omiri & Drury 2007)(Drury & Tayles 2005). These may be legitimate concerns when using the product cost information for output decisions, cost reductions, or performance measurement purposes. However, if the cost information is used to make pricing decisions, it might also be hypothesized that the intensive competition makes the companies into price takers, which actually decreases the need for accurate cost information for pricing purposes (Baxter & Oxenfeldt 1961). The competitive market itself may offer valuable information in these instances by providing opportunities to learn from the prices of competitors and the reactions of customers (Cardinaels & Roodhooft 2004). As a result, companies may pay more attention to the feedback provided by markets and customers, which sharply reduces the impact of cost system design choices for price-setting (Waller et al. 1999). The information carried by the product cost figures may simply be of no consequence if the managers feel that they cannot diverge from established market prices in any case. Although Waller et al. (1999) found some support for this alternative hypothesis in laboratory markets, the relationship between the intensity of competition and use of cost information in pricing is still an open one. The evidence from FinnBakery (i.e., fairly intense competition, and low margins) suggests that the cost information was actually less relevant for the core act of price-setting (i.e., prices were not selected on the basis of the cost information), but still extremely important when all the interrelated decisions and alternative roles of cost information are included in the analysis.

The purpose of these illustrations is neither to claim that the proposed relationships actually exist, nor that the case evidence would clearly support them. Their role is simply to point out that there is a possibility that purpose of use is such a meaningful contingency variable that it should be recognized in contingency-based studies of cost system design (e.g. Al-Omiri & Drury 2007). If appropriate design of the costing system is truly dependent on the purpose(s) of use, it should be taken into account in research designs. First, if companies do actually design their costing systems to support particular purpose(s) of use, contingency studies with a selection approach to fit may not find any consistent relationships. Without the inclusion of the purpose of use, either as a manipulated independent variable or as a fixed parameter, in surveys, it becomes an unrecognized independent variable, which might give rise to such variability in the dependent variable that it becomes impossible to observe any statistically significant effect of other (monitored or manipulated) variables (Meredith 1998). Second, even if companies do not actually design their costing systems for a particular purpose(s) of use, and also use those systems in exactly the same manner, contingency studies with an interaction approach to fit would still suffer from the same problems. If some respondents use a costing system for cost engineering and others use it for pricing, they may report different kinds of systems as working efficiently in otherwise similar contexts. Schoute (2009) has actually provided some preliminary empirical evidence of this phenomenon by showing that satisfaction toward a complex costing system is dependent on the purpose(s) of use (i.e., whether the system is used for strategic or operational purposes). Individual contingency studies with a selection approach to fit may found some statistically significant relationships from their samples, but the “leap of faith” to inferences regarding the performance of systems would be somewhat questionable. Third, even if respondents in a particular survey comprised a homogenous group, the target populations and respondents in different surveys might be dissimilar. As a consequence, the results of different surveys may not be comparable and this may contribute to a lack of consistent findings. Brierley (2008), for instance, specifically approached British management accountants, which resulted in a certain perspective of cost system sophistication. It is quite likely that the views held by sales managers, top management, or production managers may diverge from this in many important aspects. Overall, it appears quite plausible that contingency studies would benefit from the inclusion of the purpose of use in their set of variables to study.

6.2.5. Design of product costing system to support particular purpose(s) of use

It seems quite clear that the purpose(s) of use is a relevant contingency factor when it comes to appropriate cost system design and should be considered in contingency-based research. It still remains somewhat unclear to what extent the cost system design choices were eventually affected by their intended purpose of supporting pricing practices. While some of the requirements stemming from pricing as a purpose of use appeared to be of consequence, and to guide the cost system design choices (e.g., future time orientation), other requirements were not reflected in the final design choices. For example, the sales representatives in both companies perceived customers as important cost objects, but this is not observable from the current stage of their costing systems. Ultimately, tracing and allocation of costs to individual customers appeared too burdensome and haphazard and no major changes to the existing practices were made. It also seems that although the original claim was to use cost information to support pricing, at least FinnBakery began to use the costing system for various other purpose(s) of use. This might also be typical more generally, and Roberts (1985) had claimed that accounting systems inevitably meet with unanticipated conditions and generate unanticipated consequences. As a result, it is questionable as to whether it is ever possible to anticipate the various ways in which a costing system will be used. Managers may not initially even be aware of the information that they truly need (the operational environments also change constantly), so the requirements set for cost information are likely to change over time (Wetherbe 1991). Moreover, it is likely that larger companies will use costing systems for multiple purposes of use in any case. This raises a question as to whether it is better to design a costing system for specific purpose(s) of use or to target a system that can be used flexibly to meet various unanticipated requirements. The pricing decisions were also intertwined with many other decisions (e.g., product mix, capacity planning, etc.) in the case companies, so it may be difficult to identify pricing as a specific purpose of use for the costing system (Balakrishnan & Sivaramakrishnan 2002). In FinnBakery, the pricing decisions could have also been conceptualized as product design, product mix, capacity planning, or dropout decisions.

Given these issues, it cannot be suggested that companies should design costing systems to strictly support specific purpose(s) of use or operate multiple costing systems simultaneously. They should likely still pay more attention to determining those decision-making situations that it is the intention to support (and the manner in which the cost information is used) and attempt to identify some common requirements that may be used to guide the cost system design process. It appears clear that it is impossible to provide decision-relevant costs for every particular decision-making situation, therefore a decision must be made, regarding the role that formal product costing system plays in decision-making (e.g. Noreen 1991, Bromwich & Hong 1999). Kaplan and Cooper (1992) have claimed that the purpose of a product costing system is to produce average long-term product cost figures, which can be used to attract the attention of managers by highlighting those products and services that require more detailed specific studies. Some evidence suggests that many companies actually use their systems in this manner (at least with regard to profitability analysis), but a significant proportion also directly use the produced cost figures for decision-making (Drury & Tayles 2006). Therefore, it is equally possible to more directly design a system to support certain type of decision-making situations, for example, short-term pricing decisions. Companies may also have a single embedded product costing system, which is supported by various ad-hoc systems that are developed to meet a particular purpose of use or problem at hand (Pike et al. 2011). These ad-hoc applications may use the long-term average product cost figures as input information, and shape it to better reflect the consequences of particular decisions. FinnBakery essentially used the costing system in this manner, since the specific pricing tool was employed to manipulate historical cost information to better represent the requirements set by particular decision-making situations. The important thing is to pay attention to various managerial requirements and make justified selections concerning the ways to support these needs with a formal costing system, various supporting ad hoc systems and their flexible usage. As Lukka (2007) pointed out, despite poor accounting systems, companies may actually function effectively if appropriate informal routines (i.e., actual use of the system and related practices) are used to overcome the problems in formal systems.

Although it might not be practical to design a costing system for particular purpose(s) of use, managers cannot be lulled into the belief that same cost information (i.e., cost objects, level of detail, cost classifications, etc.) serves all potential decision-making situations equally well. While the accounting department may want the data to be categorized in ways that allow control and audit, the sales department is likely to benefit more from the categorization that helps to sell effectively and efficiently (Wetherbe 1991). However, it appears plausible that the perception of usefulness is related to contextual and representational information characteristics to a great extent, and not just to accuracy of cost information. Since many of these characteristics are not directly related to structural cost system design choices (e.g., specific cost pools and cost drivers), it should be possible to meet some of the varying requirements by tailoring the same information content to particular decision-making situations. Therefore, the maintenance of a single database (i.e., a system that fulfills the requirements placed on the intrinsic information quality) from which only contextually relevant information is extracted in a specific form to support particular decision-making situations should be possible (Drury & Tayles 2006). Different aggregations may, for instance, represent the cost data by products, activities, processes, functional areas, or responsibility centers in different time periods (Pizzini 2006). The provision of contextually high-quality information places a great emphasis on the flexible design of a costing system, but it might be an improvement on the alternative of providing same cost information for all decision-making purposes. This type of flexibility was especially highlighted in FinnBakery, although the company also exploited various supporting systems to represent the cost information in a particular manner.

The flexible design and use of the costing systems might have great potential to improve the perceived usefulness of the cost information, but it is unlikely to solve all the existing problems in companies. The case evidence clearly shows that many of the problems encountered in pricing did not stem solely from the poor quality of cost information, but also from lack of interest and abilities to use it appropriately. In Finnbakery, considerable training was required before managers could truly understand the real meaning of incremental/avoidable costs (i.e., implications stemming from variable/fixed cost classification), which was eventually perceived as a highly important realization. It may simply not be sufficient to concentrate on devising technically more sophisticated costing systems; considerable attention should also be paid to their actual usage in organizations (Roberts & Scapens 1985). Therefore, instead of attempting to improve the quality of information provided, one can alternatively help managers to redeem the full value of the existing information. The highest impact is likely to be obtained by using both of these approaches simultaneously, but sometimes it might be sufficient to focus on the organizational factors that currently hinder the exploitation of cost information. This should be considered already when designing costing systems, since user attitudes may strongly determine whether or not the system is eventually used (Robey 1979). The emphasis placed on the contextual factors and manner in which different people use the costing system may pay off through favorable user attitudes, which are stimulated by involving them as part of the design work. Once the users have been motivated to try the system, they are also likely to give it a fair chance. The important factor is that, although it might not be practical to design multiple systems, there are multiple means to improve the perceived usefulness of the system in a particular decision-making situation. Moreover, the systems must evolve over time to meet various emerging requirements, but such evolution is far more manageable when they are originally built to allow for such changes (Wetherbe 1991).

7. Conclusions and implications

7.1. Conclusions

The first research question asked whether the current discussion around cost system design choices and sophistication provides an adequate understanding of the factors that affect the performance of a product costing system. The inevitable conclusion is that the management accounting literature appears to overemphasize the importance of accurate indirect costs allocation methods, and cost system sophistication is currently too narrowly conceptualized. This is especially true when the term is used to generally refer to the characteristics of costing systems that are perceived to favorably affect their performance, but also has direct consequences for the contingency-based studies in which it is more narrowly used as a specific construct. The concept of accurate indirect cost allocation has some serious ontological problems and companies always have many alternative possibilities to trace and allocate costs to various cost objects. Some companies may invest in possibilities to directly trace sales expenses to customers, while others may use multiple cost pools and cost drivers to allocate these costs to products. Moreover, even if the cost pools and cost drivers are actually perfect proxies for the system's ability to provide accurate product cost information, the accuracy as understood in the literature appears to have little meaning for practitioners. Their conceptualization of accuracy is closer to the perceived fairness of allocations, and the question of whether the selected cost drivers and associated costs do actually correlate, raises only little interest. The perceived usefulness of the cost information is at least equally related to the possibilities of exploiting and interpreting the cost information in a particular decision-making situation, rather than completely to its intrinsic quality. As a result, the performance of a costing system cannot be explained simply by referring to the intrinsic characteristics of the cost information; there is also a need to properly address the contextual, representational, and accessibility characteristics. These characteristics have rarely been discussed in the literature, but may actually partly explain why some ABC implementations are eventually abandoned and why managers perceive the quality of cost information as poor.

The second research question aimed to examine the relevancy of purpose(s) of use as a contingent variable. It asked whether pricing, as a purpose of use, affects the requirements placed on a product costing system and how these requirements are reflected in cost system design choices. The conclusion is that the requirements placed on the product costing system are shaped by the intended purpose(s) of use, so therefore it is a relevant contingency variable that should be considered in both cost system design and contingency-based accounting research. Therefore, the factors affecting the performance of a costing system do vary (at least by their weighting), depending on the purpose of use, which hinders the possibilities of understanding appropriate design choices without paying considerable attention to the actual manner in which the system is used. These requirements were also partly reflected in cost system design, and the nature of pricing as a forward-looking function was clearly visible in the established costing systems and related practices. However, it was only possible to identify some common requirements stemming from pricing as purpose of use, so few general guidelines regarding the design of a product costing system to support pricing can be given. The specific pricing situations are strongly shaped by various other contingency variables that together (as a system) determine the characteristics of appropriate cost system design. As a result, it is difficult to make inferences regarding the roles of other individual contingency variables. For example, the customer relationship-oriented business strategy appeared to exert a great effect on the importance of accurate cost information in pricing, but this relationship might be equally true in general. This means that the case evidence does not allow any final conclusions to be drawn regarding the extent to which pricing as a purpose of use eventually affects the final cost system design choices. It is still notable that even if companies do not actually design their costing systems for a particular purpose(s) of use, these findings have important consequences both for accounting research and practical efforts on building costing systems that are perceived as useful.

The ultimate objective of this dissertation was to improve understanding of the appropriate design of costing systems, and the answers given to the research questions enable some conclusions to be drawn from this broader perspective. First, although the management accounting literature easily conveys the idea that complex costing systems are always required to successfully operate companies, these systems may not be perceived as being more useful from the user perspective. As a result, a design process that focuses solely on the technical details and accuracy of a costing system may ultimately have only a relatively minor organizational impact. Second, although the purpose of use is a relevant contingency variable, it is rarely appropriate to operate multiple costing systems or design a single system to strictly support a certain purpose of use. Costing systems inevitably meet with unanticipated conditions and generate unanticipated consequences, and it seems impossible to determine in advance the ways in which the systems are eventually used. It might still be beneficial to attempt to identify certain common requirements that are shared by various decision-making situations, and use these as guiding principles in cost system design. Third, although it might not be practical to design a costing system for a particular purpose(s) of use, managers should not be lulled into the belief that the same cost information equally serves all potential decision-making situations. The better strategy is likely to meet various contextual and representational requirements by tailoring the same information content for different purposes of use. Fourth, although the flexible design and use of costing systems may have great potential to improve its perceived usefulness, it is unlikely to solve all the existing problems in companies. Many of the organizational problems do not ultimately stem from poor quality of information systems, and sometimes it may be more effective to simply help managers redeem the full value of the existing information. The research and managerial implications of these findings are further discussed in the following chapters.

7.2. Contribution to prior knowledge

The objective of the dissertation was to better understand how costing systems can be designed to support managerial decision-making in a particular context. This aim was pursued 1) by conceptually analyzing cost-system sophistication and the underlying assumptions regarding the performance of the system; 2) by supporting these conceptual arguments through the empirical analysis of cost system redesign projects in two case companies; and 3) by examining how pricing as a purpose of use affects the requirements placed on a costing system. The chain of argument is as follows: The concept of cost system sophistication is too narrow and fails to depict many important design choices and trade-offs that are involved in cost-system design processes.

As a result, it conveys a view that cost system design is primarily related to the choices regarding indirect cost allocation methods, which also determine the performance of the costing system in a particular context. However, this linkage between alleged accuracy and performance of costing systems does not stand up to critical, theoretical, or empirical examination and the performance of a costing system is heavily influenced by many other information characteristics. As a result, more emphasis should be placed on various contextual and representational factors that eventually determine whether the information is perceived as relevant and useful in a particular decision-making context. This holds true for both practical efforts to design effective costing systems and research settings/hypotheses in contingency-based studies of cost system design. Moreover, since the requirements placed on these characteristics vary from one managerial task to another, the appropriate design of costing system cannot be truly understood without paying considerable attention to the manner in which the system is actually used in organization. As a result, there is a need to analyze and identify common features among the decisions that it is the intention to support, and to use these requirements as a starting point for the cost system design process.

A significant contribution of this study relates to the conceptual framework that was created on the basis of a review of the rather fragmented cost system design literature. This was partly based on the conceptual analysis of cost system sophistication and related terminology, which has not been previously critically examined (except Brierley 2008). It has been shown that both the concept of sophistication and cost system design literature in general place a great emphasis on indirect cost allocation methods and the alleged accuracy of the costing system (see e.g. Noreen 1991, Noreen & Soderstrom 1994, Noreen & Soderstrom 1997, Bromwich & Hong 1999, Abernethy et al. 2001, Drury & Tayles 2005, Al-Omiri & Drury 2007, Labro & Vanhoucke 2007, Labro & Vanhoucke 2008). However, this is a rather narrow view of the factors that eventually determine the performance of a costing system in a particular decision-making situation, and may easily lure managers into uncritically accepting accuracy as the sole starting point for the cost system design task. Therefore, the developed conceptual framework attempted to more comprehensively depict and illustrate the various viewpoints that must be balanced when pursuing appropriate design of a costing system. It borrows from the information quality literature (e.g. Goodhue 1995, Wang & Strong 1996, Strong et al. 1997, Pipino et al. 2002) and uses general information characteristics in order to establish a theoretical linkage between the contextual variables and appropriate cost system design choices. Such an approach has not previously been used in the (identified) management accounting literature, and so provides some new insights both for practitioners and academics. It may, for instance, partly explain, or be used to explain, why complex costing systems have sometimes failed in practice (Malmi 1997a).

A further contribution relates to the empirical findings regarding the proposed framework and the role of accuracy in explaining the performance of costing systems. It was shown that 1) the entire concept of accurate indirect cost allocations is somewhat questionable (c.f. Armstrong 2002); 2), the meaning of accuracy among the practitioners differs significantly from that of the literature (c.f. Noreen 1991, Datar & Gupta 1994, Labro & Vanhoucke 2007); and 3) the performance of the costing system can only partly be explained through the intrinsic information characteristics, even if previous problems did not exist. The perceived usefulness of a costing system is heavily influenced by contextual and representational information characteristics, which affect the possibilities of benefiting from the cost information in a particular decision-making situation. This has some direct consequences for the design of contingency-based studies, which have commonly at least implicitly assumed somewhat direct relationship between accuracy and performance of a costing system (Drury & Tayles 2005, Al-Omiri & Drury 2007). Moreover, the emphasis placed on various contextual, representational, and accessibility characteristics serves as an important reminder that the performance of a costing system is not necessarily linked to its technical superiority. One implication is that the limited resources should not always be directed toward reducing the distortions in cost figures (Datar & Gupta 1994), but rather to improving and tailoring the existing information content to satisfy the contextual requirements of various decision-makers. This has rarely been discussed in the management accounting literature, probably partly because the requirements set by the various managerial tasks have not been examined. It may still have great potential to improve the perceived usefulness of costing systems and their organizational impact.

Finally, an attempt to examine the role of purpose(s) of use as a relevant contingency variable represents a significant contribution of its own. The previous literature has primarily touched on this issue on an anecdotal basis (Kaplan 1988), and not at the level of managerial tasks (Tillema 2005). For example, none of the identified contingency-based surveys have included the purpose(s) of use as an examined variable in their data sets (see e.g. Krumwiede 1998, Drury & Tayles 2005, Al-Omiri & Drury 2007). The case evidence provides preliminary support for the claim that the purpose(s) of use affects the requirements placed on the cost information. Although this does not mean that companies are, or should be, designing costing systems specifically for certain purpose(s) of use, it provides certain new insights both for contingency-based accounting research and the practical design of costing systems. From the research perspective, these findings suggest that the purpose of use might partly explain the inconsistent findings of contingency-based research, so it is important that it is involved, either as a manipulated independent variable or as a fixed parameter in surveys (Meredith 1998).The importance given to detailed cost information of manufacturing overheads is likely to differ from production manager (i.e., responsible for efficient manufacturing) to sales manager (i.e., responsible for pricing), so the performance of the system cannot be understood without paying attention to this relationship. Therefore, the findings provide a means to improve research settings in a manner that has not previously been attempted. These findings hopefully help researchers to better understand the complex nature of the cost-system design process, leading to improved theorizing of expected relationships, and eventually to more consistent findings regarding the factors that affect appropriate cost system design.

7.3. Limitations of the study

In general, the limitations of the study are those characteristics of the methodology or design that might have had an impact on the application or interpretation of the results. Although there are multiple ways of addressing these characteristics, at least the chain of evidence (internal validity), generalizability (external validity), and reliability of the findings and data are commonly assessed (Gummesson 2000). However, the purpose here is not to address all the possible limitations, but rather to highlight some of those that are most important with regard to the quality of the research and the ability to answer the research questions. The inherent problems of case studies (which are also present here), together with the means to solve them, have been widely discussed in the literature, and so have not been given much space here (see e.g. Eisenhardt 1989a, Lee 1989, Meredith 1998, Ahrens & Chapman 2006, Eisenhardt & Graebner 2007, Cooper & Morgan 2008). It simply must be accepted that the findings of case studies are contextually bound, and do not lend themselves to generalization in the conventional sense (i.e., they are not samples, but rather as such). In a similar manner, it needs to be acknowledged that it is highly unlikely that any other researcher would have chosen exactly the same methods, asked the same questions, or made the same interpretations (Meredith 1998). For example, the interpretations regarding the importance of various information characteristics are naturally subjective, and the written descriptions from their importance and roles may even misrepresent the views and thoughts that the researcher truly holds. If a reader gets the idea that the accuracy of cost information is totally irrelevant and other factors determine whether the costing system is perceived as useful or not, this was not intended (i.e., accuracy is naturally one of the most important factors). It is simply that this message has constantly been shouted from the rooftops, so the space here was given to other important variables. In addition to these inherent problems and limitations of the selected methods, there are also some more specific issues that deserve further attention with regard to this study. They are the issues that the author himself, with the benefit of hindsight, views as a major problem regarding the selected research design and gathered data.

One of the major methodological limitations of the study is related to the iterative research process, and the fact that the final research questions emerged only relatively late during the research process. Although the overall topic of the study remained fairly constant during this time, the research questions were partly modified even after completion of the first research project. As a result, much of the data were gathered without an awareness of exactly what was being pursued from the research perspective (c.f. typical characteristics of action research process). If the specific research questions had been formulated in advance, it would likely have been possible to design and guide the research projects in a manner that would have enabled more “complete” answers to the questions. For example, certain natural controls could have been better exploited, which would have likely led to more controlled observations (Lee 1989). This refers to the fact that if the research questions are known, it is easier to pay attention to the events that are relevant regarding the phenomenon of interest. For example, FinnBakery began to exploit the cost information also for other purposes of use (i.e., not only pricing), but this research opportunity was not properly utilized, since the second research question had not yet been completely formulated. Therefore, it could have been possible to obtain further data regarding the question of whether, and in which manner, the different purpose(s) of use affected the requirements placed on the cost information, if these attempts to use the cost information to support other managerial tasks had been observed. It would have also been possible to design more purposeful and relevant interventions (c.f. Suomala & Lyly-Yrjänäinen 2012), for instance, to actively feed the same information content to the various managers who are responsible for different managerial tasks.

However, the limitations of this study are not primarily related to the lost possibilities of gathering further data, but more rather to the overwhelming amount of somewhat scattered data that was collected through the loose research design and longitudinal nature of the projects. Although this “richness” of data is also a clear strength of this study, and a mean to improve its internal validity through perceptual triangulation (Bonoma 1985), a more rigor research design would have enabled more profound answers to the specific research question, as formulated in this dissertation. It now feels as though there are data that are only artificially linked to the ultimate phenomenon of interest, while the evidence to support certain claims simultaneously remains rather shallow. It is also important to remember that parsimony, namely the fact that an explanation should include only the necessary factors, is an essential criterion for a good theory (Bacharach 1989). In retrospect, it feels that the chain of evidence could have been presented in a more straightforward manner (i.e., easier for a reader to grasp), and there are many observations that only serve to add complexity without making a great deal of difference with regard to the final conclusions. The other side of the coin is that, even when described in a detailed manner, the case descriptions are always merely simplifications of the complex "reality". Therefore, whether, and how, certain pieces of evidence are presented is always ultimately a subjective choice on the part of the researcher. As a result, there was likely a great deal more evidence, both supportive and contradictory, which has not been published in this study. Although contradictory evidence was not intentionally omitted, it is always possible that selective memory (e.g., remembering only the events that support the presented claims), attribution (e.g., seeing positive results as outcomes of one's own action), or exaggeration (e.g., representation of some events as more significant than were actually suggested by the data) have played some part in this study. These issues could all have been better controlled by applying a more rigorous research design. The problem of working with an enormous amount of data is that everything appears to be related to everything else, so it is extremely difficult to justify only the "right" factors required for a logical explanation (Whetten 1989).

With regard to the generalizability and reliability of the findings, it is important to understand the level at which the results may also have some validity in other environments. As Siggelkow (2007) nicely put it: if the purpose is only to describe a particular phenomenon through case studies, you need to have a "talking pig". Unfortunately, I don't have any talking pigs, so it is ultimately the conceptual insights and their internal logic of argumentation that must convince the readers. Following this line of thought, it is the underlying theory and not the context-specific case findings that are intended to be replicable in further studies (Lee 1989). The case findings were primarily used to illustrate the conceptual arguments, and the intention is not to state that readers should believe A leading B, simply because there is a case where this might have happened. Case findings point out that such a relationship is plausible, for instance, that the performance of costing systems might be better understood by focusing on the contextual and representational characteristics of the cost information. That is essentially the theoretical argument, which can also be further tested and confirmed in a variety of other environments. Underlying reasons, their relative importance, and predicted outcomes may fairly well change from one situation to another, it is only important for the same underlying theory to be tested (Meredith 1998). The problem here is that the presented framework is highly abstract in nature, and it might be hard to derive from it any concrete testable hypotheses. Therefore, this dissertation would have benefited from a more concrete illustration of the way in which particular contextual variables, requirements for information characteristics, and cost system design choices became connected (i.e., these connections are now rather weak). This is essentially the paradox of theorizing; more general theories are necessarily stated in a more abstract and unspecific manner (Weick 1979). Ultimately, the findings are only preliminary and it remains the right of the readers and further studies to judge whether the presented chain of evidence is sufficiently credible.

7.4. Guidelines for further research

It appears that the biggest hype surrounding product costing systems died a long time ago and the management accounting scholars are currently interested in other issues. The content and citation analysis of the "Journal of Management Accounting Research" reveals that the share of articles dealing with cost accounting has almost halved during the 21st century, while more emphasis has simultaneously been given to research around management control (Lindquist & Smith 2009). However, the problem of designing useful costing systems remains relevant and the reduced number of academic articles is unlikely the result of a lack of research opportunities. In fact, despite the considerable amount of empirical research that was conducted during the 1990s, the factors affecting cost system design and performance remain poorly understood (e.g. Drury & Tayles 2005). A viable alternative to use in continuing this research would be to first focus on the requirements that are placed on cost information in a particular context and only then on different the cost system design choices through which these features are delivered. The developed conceptual framework could be used to provide some insights in how to conduct this research, but all the suggested relationships should first be examined more closely. The various contextual and representational information characteristics, and their relationship to performance of a costing system, especially provide an interesting research opportunity, since the "failure" of complex costing systems is still a mystery. This issue was partially addressed by Pizzini (2006), but there remains a need for further such studies in the manufacturing context and in relation to more general characteristics of cost information. When an improved understanding of how the requirements are shaped by the context has been gained, it might be easier to design costing systems that managers perceive as useful. It might be possible, for instance, to identify requirements that are shared by a certain class of decision-making situations (e.g., operational versus strategic, structured versus unstructured, etc.,), which would enable the design of costing systems that support broader decision categories. Schoute (2009) has already provided some support for the claim that a less complex costing system is perceived as useful when the system is used for managing revenues (e.g., pricing and customer profitability analysis) instead of managing costs.

It also appears that the actual use of the cost information to support different managerial tasks is equally poorly understood. It is probably now acknowledged that costing systems do not directly determine what people do in organizations (Roberts & Scapens 1985), but there is little knowledge regarding the actual processes through which these systems affect the individuals and their decision-making routines. The pricing literature still conveys the view that cost-based pricing methods will prevail in practice, although the importance of accurate cost information in this sense is likely to be limited. Moreover, the elemental debate is related to the use of marginal versus full-cost figures (e.g. Govindarajan & Anthony 1983), although companies are likely to use information in a far more flexible manner (Drury & Tayles 1994). As a result, further information is needed regarding the importance of cost information in order to strategically position the product in relation to competitors, to reduce the overall risk position, to simplify complex pricing decisions, to justify the decisions for various stakeholders, to learn from the functioning of the organization as a whole, to enhance price stability in the industry, to promote the perception of fairness among customers, etc. Therefore, there is a clear need to better understand the actual usage of cost information in its full diversity, not only the content of the information that is provided by the costing systems (e.g., variable versus full-cost). This is likely to require further in-depth case studies, since they provide a better means of examining the processes through which individuals exploit the cost information in various decision-making situations. It is important to bear in mind that contingent arguments can also be expressed on the basis of case studies and not only through large-scale surveys (Chapman 1997). Moreover, there is also a need for surveys to provide some statistical evidence as to whether the identified relationships (and especially the purpose of use) have any potential to better explain the perceptions regarding the usefulness of the costing systems.

7.5. Managerial implications

The management accounting literature easily conveys a view that extremely complex costing systems are required in order to successfully operate companies. In particular, many activity-based costing studies rather one-sidedly stress the importance of moving closer to "true" cost figures, by including additional cost drivers and overhead cost pools. As a result, it may appear tempting to address various organizational problems by designing improved decision aid systems that more correctly record the "facts" that has happened in an organization over a particular period of time. However, it is important to understand that accounting systems do not neutrally and objectively mirror the organizational reality, and so the accuracy is, at least partly, just a common fallacy. Different costing systems certainly convey different images of organizational life, but it is highly questionable as to what sense they are more or less accurate, or better reflect the causal mechanisms between the resources and cost objects (e.g., products). Moreover, although accurate product cost figures would be attainable, the perceived usefulness of the systems is dependent on other variables to a great extent. Many of the existing problems may not ultimately stem from poor intrinsic quality of cost information, but instead from various contextual and representational factors that affect the possibilities to use and interpret the information in a particular decision-making context. Poor quality of information may simply be a convenient scapegoat to blame for personal ignorance and inertness towards the accounting numbers. As a result, there are always at least two alternative approaches to enhancing the use of cost information in decision-making. First, one can focus on the quality of information itself and the hope that it will lead to better understanding of the problems at hand. Second, one can look at the conditions and consequences of the actual use of existing information and help decision-makers to better redeem its full value. The greatest impact is likely to be obtained by using both of these approaches, but sometimes it might be enough to simply focus on the organizational factors that currently hinder the exploitation of cost information. Regardless, it might be both dangerous and costly to be lulled into a belief that the problems stemming from poor information could be solved simply by designing more complex costing systems.

Since the requirements placed on cost information vary considerable from one situation to another, costing systems must be designed to support certain managerial needs. In the most basic sense, the intended purpose(s) of use and the contextual environment determines which cost objects are perceived as relevant and how they should be defined. The optimal costing system for control of manufacturing function is likely to differ from one that is aimed at supporting pricing decisions. However, that is not to say that companies should operate multiple costing systems, but rather that they should place greater emphasis on analyzing the common features of various decision-making situations that the system is intended to support. The system that makes compromises in every aspect of its design becomes easily unable to support anything. Regarding this proposal that costing systems should be always configured to support specific managerial needs, there are some worrisome trends in the observed practices of cost system redesign projects. First, costing systems are nowadays commonly embedded in ERP systems, and are altered only when the entire system is either updated or changed. The focus of these projects is often on the modules that are essential for the functioning of the system and organization (e.g., production planning, financial accounting, etc.), while the attention paid to managerial costing is only limited. Second, ERP projects are often led by consultants who are not familiar with the context in which the system is intended to be used. Although the users are naturally involved in the process, they might be unable to communicate their needs in a manner that would lead to appropriate cost system design choices. It is also possible that their perception of needs is greatly influenced by the functionality of the existing system and considerable experimentation is required before the appropriate solution can be found. Without explicitly focusing on the particular context and manner in which the cost system is used, the redesigned system may simply become a clone of a previous (poorly functioning) system or a hasty implementation of some standard solution. Since these systems may not be perceived as useful in those particular contexts in which they are used, they might soon lose their credibility and eventually get abandoned as incapable of providing relevant information to support decision-making.

Finally, when it comes to pricing, it is important to understand that the role and value of cost information is not limited to obtaining better congruence between the costs and prices. Indeed, such practices might even be harmful, since they fail to exploit differences in customer valuations. Customers are ultimately not interested in costs that are incurred in producing the product, but the benefits that the product can deliver. From the managerial perspective, it remains important to focus both on the revenue and cost sides of the problem, since profitability is always their combined effect. Although it is not realistic to expect that the costing system may ever depict all the consequences of decisions throughout the organization, it may help in aligning the various objectives that are involved. The real value of a costing system may therefore lie in the fact that it provides various stakeholders with a common language through which to communicate their viewpoints regarding the problem at hand. This may also provide managers with an important opportunity to learn from the functioning of the entire organization and their own role in relation to it. However, these benefits do not directly occur by redesigning the costing system, but may require the organization to rethink the processes through which the pricing decisions are made. These processes are likely to differ considerably from one company to another, but there are still some common characteristics that are shared by many pricing decisions. Pricing decisions, for instance, focus on future products and require information regarding costs to serve various customers and to operate through different channels. By producing the cost information from the right cost objects, at the right level of detail, and in the right format, it is possible to better support pricing by means of costing systems. It remains important to bear in mind that measures only provide information for improving something, and the real impact on organizational performance always requires an exploitation of this information. Ultimately, it all comes back to motivation.

References

Abernethy, M.A., Lillis, A.M., Brownell, P. & Carter, P. 2001, "Product diversity and costing system design choice: field study evidence", *Management Accounting Research,* vol. 12, no. 3, pp. 261-279.

Ackoff, R.L. 1967, "Management misinformation systems", *Management Science,* vol. 14, no. 4, pp. B147-B156.

Adams, M. 1996, "Activity-based costing (ABC) and the life insurance industry", *The Service Industries Journal,* vol. 16, no. 4, pp. 511-526.

Ahlberg, J., Hoover Jr., W.E., de Mora, H. & Nauclér, T. 1995, "Pricing commodities: What you see is not what you get", *McKinsey Quarterly,* vol. 1, no. 3, pp. 66-77.

Ahmed, M.N. & Scapens, R.W. 2003, "The evolution of cost-based pricing rules in Britain: an institutionalist perspective", *Review of Political Economy,* vol. 15, no. 2, pp. 173.

Ahrens, T. & Chapman, C.S. 2006, "Doing qualitative field research in management accounting: Positioning data to contribute to theory", *Accounting, Organizations and Society,* vol. 31, no. 8, pp. 819-841.

Ahrens, T. 2008, "Overcoming the subjective–objective divide in interpretive management accounting research", *Accounting, Organizations and Society,* vol. 33, no. 2–3, pp. 292-297.

Alfred, A.M. 1972, "Company pricing policy", *The Journal of Industrial Economics,* vol. 21, no. 1, pp. 1-16.

Alfred, W. 1996, "The value of distorting overhead cost allocations in an agency setting", *Management Accounting Research,* vol. 7, no. 4, pp. 367-385.

Al-Omiri, M. & Drury, C. 2007, "A survey of factors influencing the choice of product costing systems in UK organizations", *Management Accounting Research,* vol. 18, no. 4, pp. 399-424.

Anderson, M.C., Banker, R.D. & Janakiraman, S.N. 2003, "Are selling, general, and administrative costs "sticky"?", *Journal of Accounting Research,* vol. 41, no. 1, pp. 47-63.

Anderson, S. 1995, "A framework for assessing cost management system changes: the case of activity based costing implementation at General Motors", *Journal of Management Accounting Research,* vol. 7, pp. 1-51.

Armstrong, P. 2002, "The costs of activity-based management", *Accounting, Organizations and Society,* vol. 27, no. 1–2, pp. 99-120.

Ashton, R.H. 1976, "Cognitive changes induced by accounting changes: Experimental evidence on the functional fixation hypothesis", *Journal of Accounting Research,* vol. 14, no. 1, pp. 1-17.

Atkinson, A.A., Kaplan, R.S. & Young, S.M. 2004, *Management accounting,* Prentice-Hall, Upper Saddle river.

Auty, S. 1995, "Using conjoint analysis in industrial marketing: The role of judgment", *Industrial Marketing Management*, vol. 24, no. 3, pp. 191-206.

Avlonitis, G.J. & Indounas, K.A. 2005, "Pricing objectives and pricing methods in the services sector", *Journal of Services Marketing*, vol. 19, no. 1, pp. 47-57.

Baard, V. 2010, "A critical review of interventionist research", *Qualitative Research in Accounting & Management*, vol. 7, no. 1, pp. 13-45.

Babad, Y.M. & Balachandran, B.V. 1993, "Cost driver optimization in activity-based costing", *Accounting Review*, vol. 68, no. 3, pp. 563-575.

Bacharach, S.B. 1989, "Organizational theories: some criteria for evaluation", *The Academy of Management Review*, vol. 14, no. 4, pp. 496-515.

Baker, R.J. 2006, *Pricing on purpose: Creating and capturing value*, J. Wiley, Hoboken, N.J.

Balakrishnan, R. & Sivaramakrishnan, K. 2002, "A critical overview of the use of full-cost data for planning and pricing", *Journal of Management Accounting Research*, vol. 14, no. 1, pp. 3-31.

Banker, R.D. & Hughes, J.S. 1994, "Product costing and pricing", *The Accounting Review*, vol. 69, no. 3, pp. 479-494.

Barnes, P. & Webb, J. 1986, "Management information changes and functional fixation: Some experimental evidence from the public sector", *Accounting, Organizations and Society*, vol. 11, no. 1, pp. 1-18.

Baxendale, S.J., Raju, P.S. & Gupta, M. 2006, "The selection of actionable cost objects for an activity-based costing system", *Management Accounting Quarterly*, vol. 7, no. 3, pp. 9-13.

Baxter, W.T. & Oxenfeldt, A.R. 1961, "Costing and pricing: the cost accountant versus the economist", *Business horizons*, vol. 4, no. 4, pp. 77-90.

Becker, H.S. & Geer, B. 1957, "Participant observation and interviewing: A comparison", *Human Organization*, vol. 16, no. 3, pp. 28-32.

Ben-Arieh, D. & Qian, L. 2003, "Activity-based cost management for design and development stage", *International Journal of Production Economics*, vol. 83, no. 2, pp. 169-183.

Benbasat, I., Goldstein, D.K. & Mead, M. 1987, "The case research strategy in studies of information systems", *MIS Quarterly*, vol. 11, no. 3, pp. 369-386.

Bhaskar, V., Manning, A. & To, T. 2002, "Oligopsony and monopsonistic competition in labor markets", *The Journal of Economic Perspectives*, vol. 16, no. 2, pp. 155-174.

Bitran, G. & Caldentey, R. 2003, "An overview of pricing models for revenue management", *Manufacturing & Service Operations Management*, vol. 5, no. 3, pp. 203-229.

Bjørnenak, T. 1997, "Diffusion and accounting: the case of ABC in Norway", *Management Accounting Research*, vol. 8, no. 1, pp. 3-17.

Bonoma, T.V. 1985, "Case research in marketing: Opportunities, problems, and a process", *Journal of Marketing Research*, vol. 22, no. 2, pp. 199-208.

Brennan, R., Canning, L. & McDowell, R. 2007, "Price-setting in business-to-business markets", *Marketing Review,* vol. 7, no. 3, pp. 207-234.

Brierley, J.A., Cowton, C.J. & Drury, C. 2001, "Research into product costing practice: a European perspective", *The European Accounting Review,* vol. 10, no. 2, pp. 215-256.

Brierley, J.A. 2010, "The determinants of overhead assignment sophistication in product costing systems", *Journal of Corporate Accounting & Finance,* vol. 21, no. 4, pp. 69-75.

Brierley, J.A. 2008, "Toward an understanding of the sophistication of product costing systems", *Journal of Management Accounting Research,* vol. 20, no. 1 (Supplement), pp. 61-78.

Brignall, S. 1997, "A contingent rationale for cost system design in services", *Management Accounting Research,* vol. 8, no. 3, pp. 325-346.

Bromwich, M. 2007, "Economics in management accounting" in *Handbook of management accounting research,* eds. C.S. Chapman, A.G. Hopwood & M.D. Shields, Elsevier, Amsterdam, pp. 137-162.

Bromwich, M. & Hong, C. 1999, "Activity-based costing systems and incremental costs", *Management Accounting Research,* vol. 10, no. 1, pp. 39-60.

Buchanan, J.M. 1969, *Cost and choice: An inquiry in economic theory,* University of Chicago Press, Chicago Ill.

Burchell, S., Clubb, C., Hopwood, A., Hughes, J. & Nahapiet, J. 1980, "The roles of accounting in organizations and society", *Accounting, Organizations and Society,* vol. 5, no. 1, pp. 5-27.

Burns, T. 1961, *The management of innovation,* Tavistock, London.

Burrell, G. & Morgan, G. 1979, *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life,* 2011 second reprint edn, Ashgate, Farnham.

Cagwin, D. & Bouwman, M.J. 2002, "The association between activity-based costing and improvement in financial performance", *Management Accounting Research,* vol. 13, no. 1, pp. 1-39.

Cardinaels, E. 2008, "The interplay between cost accounting knowledge and presentation formats in cost-based decision-making", *Accounting, Organizations and Society,* vol. 33, no. 6, pp. 582-602.

Cardinaels, E. & Roodhooft, F. 2004, "The value of activity-based costing in competitive pricing decisions", *Journal of Management Accounting Research,* vol. 16, pp. 133-148.

Carson, D., Gilmore, A., Cummins, D., Aodheen O'Donnell & Grant, K. 1998, "Price setting in SMEs: some empirical findings", *Journal of Product & Brand Management,* vol. 7, no. 1, pp. 74-86.

Carsten, H. 2001, "A note on optimal cost driver selection in ABC", *Management Accounting Research,* vol. 12, no. 2, pp. 197-205.

Chapman, C.S. 1997, "Reflections on a contingent view of accounting", *Accounting, Organizations and Society,* vol. 22, no. 2, pp. 189-205.

Chenhall, R.H. 2003, "Management control systems design within its organizational context: findings from contingency-based research and directions for the future", *Accounting, Organizations and Society,* vol. 28, no. 2-3, pp. 127-168.

Chenhall, R.H. 2004, "The role of cognitive and affective conflict in early implementation of activity-based cost management", *Behavioral Research in Accounting,* vol. 16, no. 1, pp. 19-44.

Chenhall, R.H. & Morris, D. 1986, "The impact of structure, environment, and interdependence on the perceived usefulness of management accounting systems", *The Accounting Review,* vol. 61, no. 1, pp. 16-35.

Chua, W.F. 1986, "Radical developments in accounting thought", *The Accounting Review,* vol. 61, no. 4, pp. 601-632.

Church, A.H. 1916, *The proper distribution of expense burden,* The Engineering Magazine Co., New York.

Clark, J.M. 1923, *Studies in the economics of overhead costs,* The University of Chicago Press, Chicago, Illinois.

Clarke, P.J. 1997, "Management accounting practices in large Irish manufacturing firms", *Irish Business and Administrative Research,* vol. 18, no. 1, pp. 136-152.

Clarke, P.J., Hill, N.T. & Stevens, K. 1999, "Activity-based costing in Ireland: Barriers to, and opportunities for, change", *Critical Perspectives on Accounting,* vol. 10, no. 4, pp. 443-468.

Cleland, K. 2004, "As easy as CBA?", *Financial Management,* , pp. 30-34.

Cobb, I. 1992, *Activity based costing: problems in practice,* CIMA, London.

Cokins, G. 1996, *Activity-based cost management making it work : A manager's guide to implementing and sustaining an effective ABC system,* Irwin, Chicago, IL.

Cooper, D.J. & Morgan, W. 2008, "Case study research in accounting", *Accounting Horizons,* vol. 22, no. 2, pp. 159-178.

Cooper, R. 1989a, "The rise of activity-based costing - part three: How many cost drivers do you need, and how you select them?", *Journal of Cost Management,* vol. 2, no. 4, pp. 34-46.

Cooper, R. 1989b, "You need a new cost system when...", vol. 67, no. 1, pp. 77-82.

Cooper, R. 1988a, "The rise of activity-based costing - part one: What is an activity-based cost system?", *Journal of Cost Management,* vol. 2, no. 2, pp. 45-54.

Cooper, R. 1988b, "The rise of activity-based costing - part two: When do I need an activity-based cost system?", *Journal of Cost Management*, vol. 2, no. 3, pp. 41-48.

Cooper, R. & Kaplan, R.S. 1992, "Activity-based systems: measuring the costs of resource usage", *Accounting Horizons,* vol. 6, no. 3, pp. 1-13.

Cooper, R. & Kaplan, R.S. 1988a, "How cost accounting distorts product costs", *Strategic Finance,* vol. 69, no. 10, pp. 20-27.

Cooper, R. & Kaplan, R.S. 1988b, "Measure costs right: make the right decision", *Harvard business review,* vol. 66, no. 5, pp. 96-103.

Coughlan, P. & Coghlan, D. 2002, "Action research for operations management", *International Journal of Operations & Production Management,* vol. 22, no. 2, pp. 220-240.

Cross, R.G. & Dixit, A. 2005, "Customer-centric pricing: The surprising secret for profitability", *Business horizons,* vol. 48, no. 6, pp. 483-491.

Crossan, M.M., Lane, H.W. & White, R.E. 1999, "An organizational learning framework: From intuition to institution", *The Academy of Management Review,* vol. 24, no. 3, pp. 522-537.

Cunningham, D. & Hornby, W. 1993, "Pricing decision in small firms: theory and practice", *Management Decision,* vol. 31, no. 7, pp. 46-46.

Cyert, R.M. 1963, *A behavioral theory of the firm,* Prentice-Hall, Englewood Cliffs (NJ).

Da Silveira, G., Borenstein, D. & Fogliatto, F.S. 2001, "Mass customization: Literature review and research directions", *International Journal of Production Economics,* vol. 72, no. 1, pp. 1-13.

Datar, S.M. & Gupta, M. 1994, "Aggregation, specification and measurement errors in product costing", *The Accounting Review,* vol. 69, no. 4, pp. 567-591.

Dean, J. 1950, "Pricing policies for new products", *Harvard business review,* vol. 28, no. 6, pp. 45-53.

DeLone, W.H. & McLean, E.R. 1992, "Information systems success: The quest for the dependent variable", *Information Systems Research,* vol. 3, no. 1, pp. 60-95.

Diamantopoulos, A. & Mathews, B.P. 1993, "Managerial perceptions of the demand curve: Evidence from a multiproduct firm", *European Journal of Marketing,* vol. 27, no. 9, pp. 5-18.

Diamantopoulos, A. & Mathews, B.P. 1994, "The specification of pricing objectives: empirical evidence from an oligopoly firm", *Managerial and Decision Economics,* vol. 15, no. 1, pp. 73-85.

Dierickx, I. & Cool, K. 1989, "Asset stock accumulation and sustainability of competitive advantage", *Management Science,* vol. 35, no. 12, pp. 1504-1511.

DiMaggio, P.J. & Powell, W.W. 1983, "The iron cage revisited: Institutional Iiomorphism and collective rationality in organizational fields", *American Sociological Review,* vol. 48, no. 2, pp. 147-160.

DiMaggio, P.J. 1995, "Comments on "What theory is not"", *Administrative Science Quarterly,* vol. 40, no. 3, pp. 391-397.

Dockner, E. & Jørcensen, S. 1988, "Optimal pricing strategies for new products in dynamic oligopolies", *Marketing Science,* vol. 7, no. 4, pp. 315-334.

Donaldson, T. & Preston, L.E. 1995, "The stakeholder theory of the corporation: Concepts, evidence, and implications", *Academy of Management Review,* vol. 20, no. 1, pp. 85-91.

Dopuch, N. 1993, "A perspective on cost drivers", *Accounting Review,* vol. 68, no. 3498, pp. 615-620.

Drazin, R. & Van de Ven, A.H. 1985, "Alternative forms of fit in contingency theory", *Administrative Science Quarterly,* vol. 30, no. 4, pp. 514-539.

Drury, C. 2004, *Management and cost accounting,* Thomson, London.

Drury, C. & Tayles, M. 2005, "Explicating the design of overhead absorption procedures in UK organizations", *The British Accounting Review,* vol. 37, no. 1, pp. 47-84.

Drury, C. & Tayles, M. 1994, "Product costing in UK manufacturing organizations", *The European Accounting Review,* vol. 3, no. 3, pp. 443-469.

Drury, C. & Tayles, M. 2006, "Profitability analysis in UK organizations: An exploratory study", *The British Accounting Review,* vol. 38, no. 4, pp. 405-425.

Dugdale, D. & Jones, T.C. 1997, "How many companies use ABC for stock valuation? A comment on Innes and Mitchell's questionnaire findings", *Management Accounting Research,* vol. 8, no. 2, pp. 233-240.

Duke, C.R. 1994, "Matching appropriate pricing strategy with markets and objectives", *Journal of Product & Brand Management,* vol. 3, no. 2, pp. 15-27.

Dutta, S., Zbaracki, M.J. & Bergen, M. 2003, "Pricing process as a capability: a resource-based perspective", *Strategic Management Journal,* vol. 24, no. 7, pp. 615-630.

Duverlie, P. & Castelain, J.M. 1999, "Cost estimation during design step: parametric method versus case based reasoning method", *The International Journal of Advanced Manufacturing Technology,* vol. 15, no. 12, pp. 895-906.

Edwards, R.S. 1952, "The pricing of manufactured products", *Economica,* vol. 19, no. 75, pp. 298-307.

Eisenhardt, K.M. 1989a, "Building theories from case study research", *Academy of Management Review,* vol. 14, no. 4, pp. 532-550.

Eisenhardt, K.M. 1989b, "Agency theory: an assessment and review", *Academy of Management Review,* vol. 14, no. 1, pp. 57-74.

Eisenhardt, K.M. & Graebner, M.E. 2007, "Theory building from cases: Opportunities and challenges", *Academy of Management Journal,* vol. 50, no. 1, pp. 25-32.

Fiedler, F.E. 1964, "A contingency model of leadership effectiveness" in *Advances in Experimental Social Psychology,* ed. L. Berkowitz, Academic Press, , pp. 149-190.

Forbis, J.L. & Mehta, N.T. 1981, "Value-based strategies for industrial products", *Business horizons,* vol. 24, no. 3, pp. 32-32.

Forza, C. & Salvador, F. 2008, "Application support to product variety management", *International Journal of Production Research,* vol. 46, no. 3, pp. 817-836.

Foster, G. & Swenson, D. 1997, "Measuring the success of activity-based cost management and its determinants", *Journal of Management Accounting Research,* vol. 9, no. 1, pp. 109-142.

Foster, G. & Gupta, M. 1994, "Marketing, cost management and management accounting", *Journal of Management Accounting Research,* vol. 6, pp. 43-77.

Friedl, G. & Pedell, B. 2005, "Relevance added: Combining ABC with German cost accounting", *Strategic Finance,* vol. 86, no. 12, pp. 56-61.

Friedman, M. 2007, "The social responsibility of business is to increase its profits" in *Corporate Ethics and Corporate Governance,* eds. W.C. Zimmerli, M. Holzinger & K. Richter, Springer Berlin Heidelberg, , pp. 173-178.

Friedman, M. 1953, *Essays in positive economics,* University of Chicago Press, Chicago, IL.

Garner, S.P. 1947, "Historical development of cost accounting", *The Accounting Review,* vol. 22, no. 4, pp. 385-389.

Garvin, D.A. 1984, "What does "product quality" really mean?", *Sloan management review,* vol. 26, no. 1, pp. 25-43.

Geiger, D.R. 2001, "Practical issues in avoiding pitfalls in managerial costing implementation", *The Journal of Government Financial Management,* vol. 50, no. 1, pp. 26-34.

Geiger, D.R. 1999a, "Practical issues in cost driver selection for managerial costing systems", *The Journal of Government Financial Management,* vol. 48, no. 3, pp. 32-39.

Geiger, D.R. 1999b, "Practical issues in cost object selection and measurement", *Government Accountants Journal,* vol. 48, no. 2, pp. 46.

Geiger, D.R. & Ittner, C.D. 1996, "The influence of funding source and legislative requirements on government cost accounting practices", *Accounting, Organizations and Society,* vol. 21, no. 6, pp. 549-567.

Gerdin, J. & Greve, J. 2004, "Forms of contingency fit in management accounting research - a critical review", *Accounting, Organizations and Society,* vol. 29, no. 3-4, pp. 303-326.

Gerdin, J. & Greve, J. 2008, "The appropriateness of statistical methods for testing contingency hypotheses in management accounting research", *Accounting, Organizations and Society,* vol. 33, no. 7–8, pp. 995-1009.

Goebel, D.J., Marshall, G.W. & Locander, W.B. 1998, "Activity-based costing: Accounting for a market orientation", *Industrial Marketing Management,* vol. 27, no. 6, pp. 497-510.

Goldberg, P. & Hellerstein, R. 2007, "Sticky prices: Why firms hesitate to adjust the price of their goods", *Current Issues in Economics and Finance,* vol. 13, no. 10, pp. 1-7.

Goodhue, D.L. 1995, "Understanding user evaluations of information systems", *Management Science,* vol. 41, no. 12, pp. 1827-1844.

Gorry, G.A. & Scott Morton, M.S. 1971, "A framework for management information systems", *Sloan management review,* vol. 13, no. 1, pp. 55-70.

Gosselin, M. 1997, "The effect of strategy and organizational structure on the adoption and implementation of activity-based costing", *Accounting, Organizations and Society,* vol. 22, no. 2, pp. 105-122.

Govindarajan, V. & Anthony, R.N. 1983, "How firms use cost data in price decisions", *Management Accounting,* vol. 65, no. 1, pp. 30-34.

Green, P.E., Krieger, A.M. & Wind, Y. 2001, "Thirty years of conjoint analysis: Reflections and prospects", *Interfaces,* vol. 31, no. 3, pp. 56-73.

Grewal, D., Monroe, K.B. & Krishnan, R. 1998, "The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions", *Journal of Marketing,* vol. 62, no. 2, pp. 46-59.

Guba, E.G. & Lincoln, Y.S. 1994, "Competing paradigms in qualitative research" in *Handbook of Qualitative Research*, eds. N.K. Denzin & Y. Lincoln, Sage Publications, Thousand Oaks, pp. 105-117.

Gummesson, E. 2000, *Qualitative methods in management research,* Sage Publications.

Gunasekaran, A. 1999, "A framework for the design and audit of an activity-based costing system", *Managerial Auditing Journal,* vol. 14, no. 3, pp. 118-126.

Gupta, M. & Galloway, K. 2003, "Activity-based costing/management and its implications for operations management", *Technovation,* vol. 23, no. 2, pp. 131-138.

Gupta, M.C. & Di Benedetto, C.A. 2007, "Optimal pricing and advertising strategy for introducing a new business product with threat of competitive entry", *Industrial Marketing Management,* vol. 36, no. 4, pp. 540-548.

Hall, R.L. & Hitch, C.J. 1939, "Price theory and business behaviour", *Oxford Economic Papers,* , no. 2, pp. 12-45.

Hall, S., Walsh, M. & Yates, A. 2000, "Are UK companies' prices sticky?", *Oxford Economic Papers,* vol. 52, no. 3, pp. 425-446.

Hansen, D.R. & Mowen, M.M. 2006, *Cost management: Accounting and control,* Thomson/South-Western, Mason, Ohio.

Headland, T. 1990, *Emics and etics the insider/outsider debate,* SAGE, Newbury Park, Calif.

Heilbroner, R.L. 2000, *The worldly philosophers the lives, times, and ideas of the great economic thinkers,* Penguin, London.

Herman Diller 2008, "Price fairness", *The Journal of Product and Brand Management,* vol. 17, no. 5, pp. 353-355.

Heron, J. & Reason, P. 1997, "A participatory inquiry paradigm", *Qualitative Inquiry,* vol. 3, no. 3, pp. 274-294.

Hicks, D.T. 1992, "A modest proposal for pricing decisions", *Management Accounting,* vol. 74, no. 5, pp. 50-53.

Hinterhuber, A. 2008, "Customer value-based pricing strategies: why companies resist", *Journal of Business Strategy,* vol. 29, no. 4, pp. 41-50.

Hinterhuber, A. 2004, "Towards value-based pricing - An integrative framework for decision making", *Industrial Marketing Management,* vol. 33, no. 8, pp. 765-778.

Hiromoto, T. 1988, "Another hidden edge - Japanese management accounting", *Harvard Business Review,* vol. 66, no. 4, pp. 22-26.

Hopwood, A.G. 1987, "The archaeology of accounting systems", *Accounting, Organizations and Society,* vol. 12, no. 3, pp. 207-234.

Hoque, Z. 2000, "Just-in-time production, automation, cost allocation practices and importance of cost information: an empirical investigation in New Zealand-based manufacturing organizations
", *The British Accounting Review,* vol. 32, no. 2, pp. 133-159.

Horngren, C.T. 2012, *Cost accounting: A managerial emphasis,* Pearson Education Limited, Harlow.

Huefner, R.J. & Largay, J.A. 2008, "The role of accounting information in revenue management", *Business horizons,* vol. 51, no. 3, pp. 245-255.

Hvam, L., Pape, S. & Nielsen, M. 2006, "Improving the quotation process with product configuration", *Computers in Industry,* vol. 57, no. 7, pp. 607-621.

Hyrylä, L. 2011, *Leipomoteollisuus,* Työ- ja elinkeinoministeriö, Helsinki.

Indounas, K. 2009, "Successful industrial service pricing", *Journal of Business & Industrial Marketing,* vol. 24, no. 2, pp. 86-97.

Indounas, K. 2006, "Making effective pricing decisions", *Business horizons,* vol. 49, no. 5, pp. 415-424.

Ingenbleek, P., Debruyne, M., Frambach, R.T. & Verhallen, T.M.M. 2003, "Successful new product pricing practices: a contingency approach", *Marketing Letters,* vol. 14, no. 4, pp. 289-305.

Innes, J. & Mitchell, F. 1995, "A survey of activity-based costing in the U.K.'s largest companies", *Management Accounting Research,* vol. 6, no. 2, pp. 137-153.

Innes, M., Mitchell, F. & Sinclair, D. 2000, "Activity-based costing in the U.K.'s largest companies: a comparison of 1994 and 1999 survey results", *Management Accounting Research,* vol. 11, no. 3, pp. 349-362.

Jeans, M. & Morrow, M. 1989, "The practicalities of using activity-based costing", *Management Accounting,* vol. 67, no. 10, pp. 42.

Jevons, S. 1866, "Brief account of a general mathematical theory of political economy", *Journal of the Royal Statistical Society,* vol. XXIX, pp. 282-287.

Jick, T.D. 1979, "Mixing qualitative and quantitative methods: Triangulation in action", *Administrative Science Quarterly,* vol. 24, no. 4, pp. 602-611.

Johnson, H.T. 1972, "Early cost accounting for internal management control: Lyman Mills in the 1850's", *Business History Review,* vol. 46, no. 4, pp. 466.

Johnson, H.T. & Kaplan, R.S. 1987a, *Relevance lost: The rise and fall of management accounting,* Harvard Business School Press, Boston.

Johnson, H.T. & Kaplan, R.S. 1987b, "The importance of long-term product costs", *McKinsey Quarterly,* vol. 23, no. 4, pp. 36-48.

Johnson, H.T. 1992, "It's time to stop overselling activity-based concepts", *Management Accounting,* vol. 74, no. 3, pp. 26-35.

Justesen, L. & Mouritsen, J. 2011, "Effects of actor-network theory in accounting research", *Accounting, Auditing & Accountability Journal,* vol. 24, no. 2, pp. 161-193.

Jönsson, S. & Lukka, K. 2007, "There and back again: Doing interventionist research in management accounting" in *Handbook of management accounting research,* eds. C.S. Chapman, A.G. Hopwood & M. Shields, Elsevier, Amsterdam, The Netherlands, pp. 373-397.

Kahneman, D. 2003, "Maps of bounded rationality: psychology for behavioral economics", *The American Economic Review,* vol. 93, no. 5, pp. 1449-1475.

Kahneman, D., Knetsch, J.L. & Thaler, R. 1986, "Fairness as a constraint on profit seeking: entitlements in the market", *The American Economic Review,* vol. 76, no. 4, pp. 728-741.

Kahneman, D. & Tversky, A. 1979, "Prospect theory: An analysis of decision under risk", *Econometrica,* vol. 47, no. 2, pp. pp. 263-292.

Kakkuri-Knuuttila, M.-., Lukka, K. & Kuorikoski, J. 2008, "Straddling between paradigms: A naturalistic philosophical case study on interpretive research in management accounting", *Accounting, Organizations and Society,* vol. 33, no. 2-3, pp. 267-291.

Kalish, S. 1983, "Monopolist pricing with dynamic demand and production cost", *Marketing Science,* vol. 2, no. 2, pp. 135-159.

Kaplan, R.S. 1988, "One cost system isn't enough", *Harvard business review,* vol. 66, no. 1, pp. 61-66.

Kaplan, R.S. 1984, "The evolution of management accounting", *The Accounting Review,* vol. 59, no. 3, pp. 390-418.

Kaplan, R.S. & Anderson, S.R. 2004, "Time-driven activity-based costing", *Harward Business Review,* vol. 82, no. 11, pp. 131-138.

Kaplan, R.S. & Cooper, R. 1998, *Cost & effect: Using integrated cost systems to drive profitability and performance,* Harvard Business School Press, Boston.

Kasanen, E., Lukka, K. & Siitonen, A. 1993, "The constructive approach in management accounting research", *Journal of Management Accounting Research,* vol. 5, no. 1, pp. 243-265.

Kee, R. 2008, "The sufficiency of product and variable costs for production-related decisions when economies of scope are present", *International Journal of Production Economics,* vol. 114, no. 2, pp. 682-696.

Kee, R. & Schmidt, C. 2000, "A comparative analysis of utilizing activity-based costing and the theory of constraints for making product-mix decisions", *International Journal of Production Economics,* vol. 63, no. 1, pp. 1-17.

Khandwalla, P.N. 1972, "The effect of different types of competition on the use of management controls", *Journal of Accounting Research,* vol. 10, no. 2, pp. 275-285.

Kim Langfield-Smith 2008, "Strategic management accounting: how far have we come in 25 years?", *Accounting, Auditing & Accountability Journal,* vol. 21, no. 2, pp. 204-228.

Klompmaker, J.E., Rodgers, W.H. & Nygren, A.E. 2003, "Value, not volume", *Marketing Management,* vol. 12, no. 3, pp. 45-48.

Knight, S. & Burn, J. 2005, "Developing a framework for assessing information quality on the World Wide Web ", *Informing Science,* vol. 8, no. 1, pp. 159-172.

Krumwiede, K.R. 1998, "The implementation stages of activity-based costing and the impact of contextual and organizational factors", *Journal of Management Accounting Research,* vol. 10, pp. 239-277.

Krumwiede, K. & Suessmair, A. 2008, "A closer look at German cost accounting methods", *Management Accounting Quarterly,* vol. 10, no. 1, pp. 37-50.

Kuhn, T.S. 1996, *The structure of scientific revolutions,* University of Chicago Press, Chicago, IL.

Labro, E. & Vanhoucke, M. 2008, "Diversity in resource consumption patterns and robustness of costing systems to errors", *Management Science,* vol. 54, no. 10, pp. 1715-1730.

Labro, E. & Vanhoucke, M. 2007, "A simulation analysis of interactions among errors in costing systems", *Accounting Review,* vol. 82, no. 4, pp. 939-962.

Lancioni, R. 2005, "Pricing issues in industrial marketing", *Industrial Marketing Management,* vol. 34, no. 2, pp. 111-114.

Lanzillotti, R.F. 1958, "Pricing objectives in large companies", *The American Economic Review,* vol. 48, no. 5, pp. 921-940.

Lebas, M. 1999, "Which ABC? Accounting based on causality rather than activity-based costing", *European Management Journal,* vol. 17, no. 5, pp. 501-511.

Lee, A.S. 1989, "A scientific methodology for MIS case studies", *MIS Quarterly,* vol. 13, no. 1, pp. 33-50.

Lee, F.S. 1990, "Marginalist controversy and Post Keynesian price theory", *Journal of Post Keynesian Economics,* vol. 13, no. 2, pp. 252.

Leone, R.P., Robinson, L.M., Bragge, J. & Somervuori, O. 2012, "A citation and profiling analysis of pricing research from 1980 to 2010", *Journal of Business Research,* vol. 65, no. 7, pp. 1010-1024.

Lere, J.C. 2001, "Your product-costing system seems to be broken: now what?", *Industrial Marketing Management,* vol. 30, no. 7, pp. 587-598.

Lere, J.C. 2000, "Activity-based costing: a powerful tool for pricing", *Journal of Business & Industrial Marketing,* vol. 15, no. 1, pp. 23-33.

Lewin, K. 1946, "Action research and minority problems", *Journal of Social Issues,* vol. 2, no. 4, pp. 34-46.

Lindquist, T.M. & Smith, G. 2009, "Journal of Management Accounting Research: Content and citation analysis of the first 20 years", *Journal of Management Accounting Research,* vol. 21, no. 1, pp. 249-292.

Llewelyn, S. 2003, "What counts as "theory" in qualitative management and accounting research? Introducing five levels of theorizing", *Accounting, Auditing & Accountability Journal,* vol. 16, no. 4, pp. 662-708.

Lord, B.R. 1996, "Strategic management accounting: the emperor's new clothes?", *Management Accounting Research,* vol. 7, no. 3, pp. 347-366.

Lucas, M.R. 2003, "Pricing decisions and the neoclassical theory of the firm", *Management Accounting Research,* vol. 14, no. 3, pp. 201-217.

Lucas, M. & Rafferty, J. 2008, "Cost analysis for pricing: Exploring the gap between theory and practice", *The British Accounting Review,* vol. 40, no. 2, pp. 148-160.

Lukka, K. 2007, "Management accounting change and stability: Loosely coupled rules and routines in action", *Management Accounting Research,* vol. 18, no. 1, pp. 76-101.

Lukka, K. & Granlund, M. 2002, "The fragmented communication structure within the accounting academia: the case of activity-based costing research genres", *Accounting, Organizations and Society,* vol. 27, no. 1-2, pp. 165-190.

Lukka, K. 2010, "The roles and effects of paradigms in accounting research", *Management Accounting Research,* vol. 21, no. 2, pp. 110-115.

Machlup, F. 1967, "Theories of the firm: marginalist, behavioral, managerial", *The American Economic Review,* vol. 57, no. 1, pp. pp. 1-33.

Macintosh, N.B. & Scapens, R.W. 1990, "Structuration theory in management accounting", *Accounting, Organizations and Society,* vol. 15, no. 5, pp. 455-477.

Malhotra, N.K. 1996, "The impact of the Academy of Marketing Science on marketing scholarship: An analysis of the research published in JAMS", *Journal of the Academy of Marketing Science,* vol. 24, no. 4, pp. 291.

Malmi, T. 1999, "Activity-based costing diffusion across organizations: an exploratory empirical analysis of Finnish firms", *Accounting, Organizations and Society,* vol. 24, no. 8, pp. 649-672.

Malmi, T. 1997a, *Adoption and implementation of activity-based costing: Practice, problems and motives,* Helsinki School of Economics and Business AdministrationEditor.

Malmi, T. 1997b, "Towards explaining activity-based costing failure: accounting and control in a decentralized organization", *Management Accounting Research,* vol. 8, no. 4, pp. 459-480.

Malmi, T. & Granlund, M. 2009, "In search of management accounting theory", *European Accounting Review,* vol. 18, no. 3, pp. 597-620.

Marn, M.V. & Rosiello, R.L. 1992, "Managing price, gaining profit", *McKinsey Quarterly,* vol. 28, no. 4, pp. 18-37.

Marshall, A. 1920, *Principles of economics,* 8th edition edn, MacMillan and Co., Limited, London.

Martin, C. 1997, "Price Formation in an open economy: Theory and evidence for the United Kingdom, 1951-1991", *The Economic Journal,* vol. 107, no. 444, pp. pp. 1391-1404.

Marx, K. 2001, *Marx's capital (student edition),* London, , GBR, ElecBook.

Menger, C. 2007, *Principles of economics,* Ludwig von Mises Institute, Auburn.

Merchant, K.A. & Shields, M.D. 1993, "When and why to measure costs less accurately to improve decision making", *Accounting Horizons,* vol. 7, no. 2, pp. 76-76.

Meredith, J. 1998, "Building operations management theory through case and field research", *Journal of Operations Management,* vol. 16, no. 4, pp. 441-454.

Mevellec, P. 2009, *Cost systems design,* Palgrave Macmillan, Basingstoke.

Mill, J.S. 1969, "The nature of a cause" in *Readings in introductory philosophical analysis*, ed. J. Hospers,London, pp. 139-144.

Miller, J.G. & Vollmann, T.E. 1985, "The hidden factory", *Harvard business review,* vol. 63, no. 5, pp. 142-150.

Mintzberg, H. 1979, "An emerging strategy of "direct" research", *Administrative Science Quarterly,* vol. 24, no. 4, pp. 582-589.

Monroe, K.B. 1990, *Pricing making profitable decisions,* McGraw-Hill, New York.

Monroe, K.B. & Cox, J.L. 2001, "Pricing practices that endanger profits", *Marketing Management,* vol. 10, no. 3, pp. 42-46.

Monroe, K.B. & Della Bitta, A.J. 1978, "Models for pricing decisions", *Journal of Marketing Research,* vol. 15, no. 3, pp. 413-428.

Nagle, T. 1984, "Economic foundations for pricing", *The Journal of Business,* vol. 57, no. 1, pp. S3-S26.

Nagle, T.T. 1993, "Managing price competition", *Marketing Management,* vol. 2, no. 1, pp. 36-45.

Nagle, T.T., Hogan, J.E. & Zale, J. 2011, *The strategy and tactics of pricing: A guide to growing more profitable,* 5th edn, Pearson, Boston.

Neilimo, K. & Näsi, J. 1980, *Nomoteettinen tutkimusote ja suomalainen yrityksen taloustiede. Tutkimus positivismin soveltamisesta,* Tampere.

Niazi, A., Dai, J.S., Balabani, S. & Seneviratne, L. 2006, "Product cost estimation: Technique classification and methodology review", *Journal of Manufacturing Science and Engineering,* vol. 128, no. 2, pp. 563-575.

Noble, P.M. & Gruca, T.S. 1999, "Industrial pricing: Theory and managerial practice", *Marketing Science,* vol. 18, no. 3, pp. 435-454.

Nordhaus, W.D. & Godley, W. 1972, "Pricing in the trade cycle", *The Economic Journal,* vol. 82, no. 327, pp. 853-882.

Noreen, E. 1991, "Conditions under which activity-based cost systems provide relevant costs", *Journal of Management Accounting Research,* vol. 3, no. 1, pp. 159-168.

Noreen, E. & Soderstrom, N. 1997, "The accuracy of proportional cost models: Evidence from hospital service departments", *Review of Accounting Studies*, vol. 2, no. 1, pp. 89-114.

Noreen, E. & Soderstrom, N. 1994, "Are overhead costs strictly proportional to activity?: Evidence from hospital departments", *Journal of Accounting and Economics*, vol. 17, no. 1–2, pp. 255-278.

Outhwaite, W. 1987, *New philosophies of social science realism, hermeneutics and critical theory*, Macmillan, London.

Pass, C. 1971, "Pricing policies and market strategy", *European Journal of Marketing*, vol. 5, no. 3, pp. 94-98.

Pavlatos, O. & Paggios, I. 2009, "A survey of factors influencing the cost system design in hotels", *International Journal of Hospitality Management*, vol. 28, no. 2, pp. 263-271.

Pike, R.H., Tayles, M.E. & Mansor, N.N.A. 2011, "Activity-based costing user satisfaction and type of system: A research note", *The British Accounting Review*, vol. 43, no. 1, pp. 65-72.

Piper, J.A. & Walley, P. 1990, "Testing ABC logic", *Management Accounting*, vol. 68, no. 8, pp. 37,42.

Pipino, L.L., Lee, Y.W. & Wang, R.Y. 2002, "Data quality assessment", *Communications of the ACM*, vol. 45, no. 4, pp. 211-218.

Pizzini, M.J. 2006, "The relation between cost-system design, managers' evaluations of the relevance and usefulness of cost data, and financial performance: an empirical study of US hospitals", *Accounting, Organizations and Society*, vol. 31, no. 2, pp. 179-210.

Popper, K.R. 1962, *The logic of scientific discovery*, Hutchinson, London.

Prest, A.R. & Turvey, R. 1965, "Cost-benefit analysis: a survey", *The Economic Journal*, vol. 75, no. 300, pp. 683-735.

Qian, L. & Ben-Arieh, D. 2008, "Parametric cost estimation based on activity-based costing: A case study for design and development of rotational parts", *International Journal of Production Economics*, vol. 113, no. 2, pp. 805-818.

Rao, A.R., Bergen, M.E. & Davis, S. 2000, *How to fight a price war*, Boston, United States, Boston.

Rapoport, R.N. 1970, "Three dilemmas in action research", *Human Relations*, vol. 23, no. 6, pp. 499-513.

Ravald, A. & Gronroos, C. 1996, "The value concept and relationship marketing", *European Journal of Marketing*, vol. 30, no. 2, pp. 19-30.

Raz, T. & Elnathan, D. 1999, "Activity based costing for projects", *International Journal of Project Management*, vol. 17, no. 1, pp. 61-67.

Reeves, C.A. & Bednar, D.A. 1994, "Defining quality: alternatives and implications", *The Academy of Management Review,* vol. 19, no. 3, pp. 419-445.

Reinstein, A. & Bayou, M.E. 1997, "Product costing continuum for managerial decisions", *Managerial Auditing Journal,* vol. 12, no. 9, pp. 490-497.

Ricardo, D. 2001, *Principles of political economy and taxation,* London, , GBR, ElecBook.

Robbins, L. 1952, *An essay on the nature and significance of economic science,* Macmillan, London.

Roberts, J. & Scapens, R. 1985, "Accounting systems and systems of accountability — understanding accounting practices in their organisational contexts", *Accounting, Organizations and Society,* vol. 10, no. 4, pp. 443-456.

Robey, D. 1979, "User attitudes and management information system use", *The Academy of Management Journal,* vol. 22, no. 3, pp. 527-538.

Roth, W.D. & Mehta, J.D. 2002, "The Rashomon effect: Combining positivist and interpretivist approaches in the analysis of contested events", *Sociological Methods & Research,* vol. 31, no. 2, pp. 131-173.

Scapens, R. 1990, "Researching management accounting practice: the role of case study methods", *British Accounting review,* vol. 22, no. 3, pp. 259-281.

Scapens, R.W. 1994, "Never mind the gap: towards an institutional perspective on management accounting practice", *Management Accounting Research,* vol. 5, no. 3–4, pp. 301-321.

Schoute, M. 2009, "The relationship between cost system complexity, purposes of use, and cost system effectiveness", *The British Accounting Review,* vol. 41, no. 4, pp. 208-226.

Shapiro, N. & Sawyer, M. 2003, "Post Keynesian price theory", *Journal of Post Keynesian Economics,* vol. 25, no. 3, pp. 355.

Sharman, P.A. 1998, "ABC systems architecture - different strokes for different folks", *CMA Magazine,* vol. 72, no. 4, pp. 15-18.

Sharman, P.A. 2003, "Bring on German cost accounting", *Strategic Finance,* vol. 85, no. 6, pp. 30-38.

Shields, M.D. 1995, "An empirical analysis of firm's implementation experiences with activity-based costing", *Journal of Management Accounting Research,* vol. 7, no. 1, pp. 148-167.

Shillinglaw, G. 1963, "The concept of attributable cost", *Journal of Accounting Research,* vol. 1, no. 1, pp. 73-85.

Shim, E. & Sudit, E.F. 1995, "How manufacturers price products", *Strategic Finance,* vol. 76, no. 8, pp. 37-37.

Shipley, D. 1981, "Pricing objectives in British manufacturing industry", *The Journal of Industrial Economics,* vol. 29, no. 4, pp. 429-443.

Shipley, D. & Jobber, D. 2001, "Integrative pricing via the pricing wheel", *Industrial Marketing Management,* vol. 30, no. 3, pp. 301-314.

Siggelkow, N. 2007, "Persuation with case studies", *Academy of Management Journal,* vol. 50, no. 1, pp. 20-24.

Simmonds, K. 1982, "Strategic management accounting for pricing: a case example", *Accounting & Business Research,* vol. 12, no. 47, pp. 206-214.

Simon, H. & Dolan, R.J. 1998, "Price customization", *Marketing Management,* vol. 7, no. 3, pp. 11-17.

Simon, H.A. 1959, "Theories of decision-making in economics and behavioral science", *The American Economic Review,* vol. 49, no. 3, pp. 253-283.

Simon, H. 1992, "Pricing opportunities - and how to exploit them", *Sloan management review,* vol. 33, no. 2, pp. 55-65.

Simons, R. 1994, "How new top managers use control systems as levers of strategic renewal", *Strategic Management Journal,* vol. 15, no. 3, pp. 169-189.

Simons, R. 1991, "Strategic orientation and top management attention to control systems", *Strategic Management Journal,* vol. 12, no. 1, pp. 49-62.

Simons, R. 1995, *Levers of control: How managers use innovative control systems to drive strategic renewal,* Harvard Business School Press, Boston, MA.

Skinner, R.C. 1970, "The determination of selling prices", *The Journal of Industrial Economics,* vol. 18, no. 3, pp. 201-217.

Skouras, T., Avlonitis, G.J. & Indounas, K.A. 2005, "Economics and marketing on pricing: how and why do they differ?", *Journal of Product & Brand Management,* vol. 14, no. 6, pp. 362-374.

Smith, A. 2001, *An inquiry into the nature and causes of the wealth of nations,* Electric Book Co, London.

Smith, G.E. 2006, "Leveraging profitability in low-margin markets", *The Journal of Product and Brand Management,* vol. 15, no. 6, pp. 358-366.

Smith, G.E. 1995, "Managerial pricing orientation: the process of making pricing decisions", *Pricing Strategy & Practice,* vol. 3, no. 3, pp. 28-39.

Smith, G.E. & Nagle, T.T. 1994, "Financial analysis for profit-driven pricing", *MIT Sloan Management Review,* vol. 35, no. 3, pp. 71-71.

Speklé, R.F. 2001, "Explaining management control structure variety: a transaction cost economics perspective", *Accounting, Organizations and Society,* vol. 26, no. 4–5, pp. 419-441.

Strong, D.M., Lee, Y.W. & Wang, R.Y. 1997, "Data quality in context", *Communications of the ACM,* vol. 40, no. 5, pp. 103-110.

Suomala, P. & Lyly-Yrjänäinen, J. 2012, *Managment accounting reserach in practice: Lesson learned from an interventionist approach,* Routledge, New York.

Susman, G.I. & Evered, R.D. 1978, "An assessment of the scientific merits of action research", *Administrative Science Quarterly,* vol. 23, no. 4, pp. 582-603.

Sutherland, J.W. 1975, *Systems analysis, administration and architecture,* Van Nostrand, New York.

Sutton, R.I. & Staw, B.M. 1995, "What theory is not", *Administrative Science Quarterly,* vol. 40, no. 3, pp. 371-384.

Taleb, N. 2007, *The black swan: The impact of the highly improbable,* Allen Lane, London.

Tellis, G.J. 1986, "Beyond the many faces of price: an integration of pricing strategies", *Journal of Marketing,* vol. 50, no. 4, pp. 146-160.

Thaler, R. 1985, "Mental accounting and consumer choice", *Marketing Science,* vol. 4, no. 3, pp. 199-214.

Tillema, S. 2005, "Towards an integrated contingency framework for MAS sophistication: case studies on the scope of accounting instruments in Dutch power and gas companies", *Management Accounting Research,* vol. 16, no. 1, pp. 101-129.

Tversky, A. & Kahneman, D. 1981, "The framing of decisions and the psychology of choice", *Science,* vol. 211, no. 4481, pp. 453-458.

Ulaga, W. & Chacour, S. 2001, "Measuring customer-perceived value in business markets: A prerequisite for marketing strategy development and implementation", *Industrial Marketing Management,* vol. 30, no. 6, pp. 525-540.

Urbany, J.E. 2001, "Justifying profitable pricing", *Journal of Product & Brand Management,* vol. 10, no. 3, pp. 141-159.

van der Haar, J.W., Kemp, R.G.M. & Omta, O. 2001, "Creating value that cannot be copied", *Industrial Marketing Management,* vol. 30, no. 8, pp. 627-636.

Van Veen-Dirks, P. & Molenaar, R. 2009, *Customer profitability pricing,* Boston, United States, Boston.

Veblen, T. 1900, "The preconceptions of economic science", *The Quarterly Journal of Economics,* vol. 14, no. 2, pp. 240-269.

Veblen, T. 1898, "Why is economics not an evolutionary science?", *The Quarterly Journal of Economics,* vol. 12, no. 4, pp. 373-397.

Voss, C., Tsikriktsis, N. & Frohlich, M. 2002, "Case research in operations management", *International Journal of Operations & Production Management,* vol. 22, no. 2, pp. 195-219.

Waller, W.S., Shapiro, B. & Sevcik, G. 1999, "Do cost-based pricing biases persist in laboratory markets?", *Accounting, Organizations and Society,* vol. 24, no. 8, pp. 717-739.

Walras, L. 1954, *Elements of pure economics, or the theory of social wealth,* .

Wang, R.W. & Strong, D.M. 1996, "Beyond accuracy: What data quality means to data consumers", *Journal of Management Information Systems,* vol. 12, no. 4, pp. 5-33.

Warburton, N. 2006, *Philosophy the classics,* Routledge, London.

Weick, K.E. 1995, "What theory is not, theorizing is", *Administrative Science Quarterly,* vol. 40, no. 3, pp. 385-390.

Weick, K.E. 1979, *The social psychology of organizing,* McGraw-Hill, New York.

Weill, P. & Olson, M.H. 1989, "An assessment of the contingency theory of management information systems", *Journal of Management Information Systems,* vol. 6, no. 1, pp. 59-85.

Westin, O. & Roberts, H. 2010, "Interventionist research – the puberty years: an introduction to the special issue", *Qualitative Research in Accounting & Management,* vol. 7, no. 1, pp. 5-12.

Wetherbe, J.C. 1991, "Executive information requirements: getting it right", *MIS Quarterly,* vol. 15, no. 1, pp. 51-65.

Weustink, I.F., ten Brinke, E., Streppel, A.H. & Kals, H.J.J. 2000, "A generic framework for cost estimation and cost control in product design", *Journal of Materials Processing Technology,* vol. 103, no. 1, pp. 141-148.

Whetten, D. 1989, "What constitutes a theoretical contribution?", *Academy of management review,* vol. 14, no. 4, pp. 490-495.

Woodruff, R.B. 1997, "Customer value: the next source for competitive advantage", *Academy of Marketing Science.Journal,* vol. 25, no. 2, pp. 139-153.

Woodward, J. 1965, *Industrial organization theory and practice,* Oxford U. P, London.

Wouters, M. & Verdaasdonk, P. 2002, "Supporting management decisions with ex ante accounting information", *European Management Journal,* vol. 20, no. 1, pp. 82-94.

Yin, R.K. 1981, "The case study crisis: Some answers", *Administrative Science Quarterly,* vol. 26, no. 1, pp. 58-65.

Zeist, R.H.J. & Hendriks, P.R.H. 1996, "Specifying software quality with the extended ISO model", *Software Quality Journal,* vol. 5, no. 4, pp. 273-284.

Tampereen teknillinen yliopisto
PL 527
33101 Tampere

Tampere University of Technology
P.O.B. 527
FI-33101 Tampere, Finland

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